...MP. INST. ENT.
— LIBRARY
19 JUN 1942
U.S.A. 126

Vol. XVIII April, 1942 No. 2

THE PAN-PACIFIC ENTOMOLOGIST

Published by the
Pacific Coast Entomological Society
in co-operation with
The California Academy of Sciences

CONTENTS

JAMES, REVIEW OF THE DIPTEROUS TRIBE MYXOSARGINI 49
FRISON, WESTERN NORTH AMERICAN STONEFLIES 61
MITCHELL, MEXICAN BEES OF THE GENUS XEROMEGACHILE 74
REES, UTAH MOSQUITO RECORDS 77
ESSIG, THE RED SCALE OUT-OF-DOORS IN BERKELEY 82
LINSLEY AND USINGER, FLAT BUGS FROM MT. LASSEN 83
GOOD, MALES OF THE FLEA GENUS ATYPHLOCERAS 87
LEECH, NOTE ON THE FOOD OF FEMALE MUTILLIDS 89
McKINSTRY, A NEW FAMILY OF HEMIPTERA FOR MACROVELIA 90

San Francisco, California

1942

THE PAN-PACIFIC ENTOMOLOGIST

EDITORIAL BOARD

E. S. Ross
Assistant Editor

R. L. Usinger
Editor

E. C. Van Dyke
Associate Editor

G. F. Ferris

E. R. Leach
Treasurer

E. G. Linsley

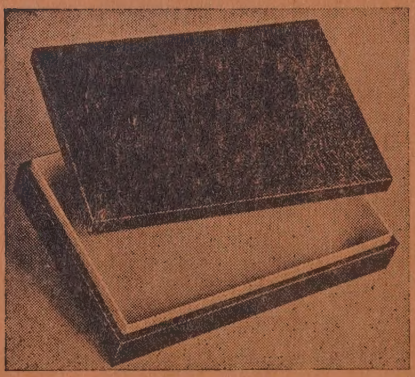
Published quarterly in January, April, July, and October with Society Proceedings appearing in the January number. Papers on the systematic and biological phases of entomology are favored, including articles up to ten printed pages on insect taxonomy, morphology, life history, and distribution.

Manuscripts for publication, proof, and all editorial matters should be addressed to the editor, R. L. Usinger, University of California College of Agriculture, Davis, California. All communications regarding non-receipt of numbers, changes of address, requests for sample copies, and all financial communications should be addressed to the assistant editor, E. S. Ross, or the treasurer, E. R. Leach, at the California Academy of Sciences, San Francisco, California.

At least twenty-five "author's extras" will be supplied free of charge. Additional copies will be *reprinted* at cost of publication, if a request is received when proof is returned.

Domestic and foreign subscriptions $2.50 per year in advance. Price for single copies 75 cents. Make checks payable to "Pan-Pacific Entomologist."

INSECT BOXES



Standard size black insect box with sides of box and cover made of 1/4" redwood. The top, bottom and shoulders are of heavy cardboard.
Inside dimensions:
12¼x8¾x2⅛ inches.
Prices:
60 cents each.
Lots of one dozen, 50 cents each.
With Masonite bottom, 15 cents extra.
With glass top, 50 cents extra.
Prices for larger quantities on request.
Unit boxes also manufactured
Prices on application

RAISIN AND THIEBAUT BROS., LTD.

346 First Street, San Francisco, Calif.

Entered as second class matter, February 10, 1925, at the postoffice at San Francisco, California, under Act of August 24, 1912.

The Pan-Pacific Entomologist

Vol. XVIII, No. 2 April, 1942

A REVIEW OF THE MYXOSARGINI

(Diptera, Stratiomyidae)

BY MAURICE T. JAMES

Colorado State College, Ft. Collins, Colorado

Most students of the Stratiomyidae have considered the genus *Myxosargus* Brauer as standing more or less alone, to be placed in the Stratiomyinae for want of a better place. However, Brauer (1882) recognized the relationship of this genus to *Melanochroa*, *Nothomyia* and, more distantly, *Exochostoma*. A study of the comparative anatomy of these genera indicates that Brauer was wholly correct; the general body form and wing venation of *Myxosargus*, *Nothomyia*, and, presumably, *Melanochroa* are practically identical, whereas the antennal structure shows an interesting series of intergrades from one genus to the other.

The tribe Myxosargini, of the Stratiomyinae, is here proposed for the above genera, as well as for *Prosopochrysa* de Meijere, *Acanthasargus* White and *Rhaphiocerina* Lindner. The question as to whether *Exochostoma* is valid, and, if so, whether it belongs here, probably will have to depend on the rediscovery of that genus. This matter has been discussed by Verrall (1901, p. 134), Séguy (1926, pp. 65-6) and Lindner (1938, p. 78). At present, all we have to depend on are Macquart's description and illustrations, which were notably inaccurate.

I am not sure whether all six genera considered here can be maintained. *Prosopochrysa*, *Rhaphiocerina*, *Nothomyia*, and *Myxosargus* seem sufficiently distinct from one another; but *Acanthasargus* and *Melanochroa* may have to be considered synonyms of *Nothomyia*. In general, the five genera are not very sharply defined.

Tribe Myxosargini James, new tribe

The tribe may be characterized as follows: Eyes of male contiguous (separated in *Melanochroa*), those of female separated, the front broadening gradually toward antennae; post ocular orbits narrow; antennae situated on more or less of an elevation, consisting of eight segments (except possibly in *Melanochroa*), the

terminal two or three segments tending to form an arista; face more or less produced downward, in *Myxosargus* noticeably so, in the other genera more obscurely so or not at all. Thorax narrow in front, broadest at wing bases; scutellum characteristically two-spined, the spines sometimes reduced to denticles or absent. Legs rather short, unmodified. Wing venation characteristic, R_1 ending near apex of discal cell; R_{2+3} short, arising considerably beyond r–m, forming at least a 45° angle with R_{4+5}, and ending near apex of R_{2+3}; (exception, *Prosopochrysa*); R_4 usually wanting; discal cell of moderate size, pentagonal or hexagonal, somewhat longer than high; media three-branched, but the first and third branches sometimes weakened, or the third even absent; second anal vein slightly but distinctly sinuate (except in *Rhaphiocerina*?), but in any event the anal cell broader on apical half. Abdomen flat, subovate, usually unicolorous, sometimes with pale markings.

PROSOPOCHRYSA de Meijere

De Meijere, 1907, Tijd. v. Ent., 50:220; Enderlein, 1914, Zool. Anz., 43:293; Brunetti, 1920, Fauna Br. India, I, p. 86; 1923, Rec. Indian Mus., 25:161.

According to Brunetti's (1923) illustrations of the head and wing, this genus certainly belongs in this tribe. The wing is essentially that of *Nothomyia* except for the complete absence of vein M_3 and the fact that vein R_{2+3} separates from R_{4+5} at cross-vein r–m, but runs closely parallel to R_{4+5} and then bends sharply to the margin. The antennae, according to Brunetti's figure, are similar to those of *Nothomyia scutellata*. The scutellum is unspined.

Genotype, *Prosopochrysa* (*Chrysochlora*) *vitripennis* Doleschall, the only species known.

PROSOPOCHRYSA VITRIPENNIS Doleschall

Doleschall, 1856, Nat. Tijd. Ned. Ind., 10:408; de Meijere, 1907, Tijd. v. Ent., 50:220; Brunetti, 1920, Fauna Br. India, I, p. 86; 1923, Rec. Indian Mus., 25:161.

Microchrysa albitarsis Brunetti, 1913, Rec. Ind. Mus., 8:156; 1920, Fauna Br. Ind., I, p. 86 (synonymy).

Geosargus vitripennis Enderlein, 1914, Zool. Anz., 43:588.

From India and Java.

RHAPHIOCERINA Lindner

Lindner, 1938, Die Fliegen der Pal. Region, 18, p. 32.

I know this genus only from Lindner's illustrations and description. The antennae are shown without an arista, but this

peculiarity is mentioned nowhere in the text and is contrary to Lindner's diagnosis of the subfamily (Geosarginae). According to the figure, vein R_4 is present; M_1 and M_3 are weak, and vanish on their apical two-thirds or more; M_2 extends almost to the wing margin, and 2nd A is straight, though it diverges from the basal part of the cubitus. The thorax and abdomen, in the one species known, are metallic black marked with yellow, the former with widely separated longitudinal stripes, the latter with lateral and apical margins and interrupted posterior margins of the segments.

Genotype, *Rhaphiocerina* (*Rhaphiocera*) *hakiensis* Mats., the only species known.

RHAPHIOCERINA HAKIENSIS Matsumura

Matsumura, 1906, Thousand Insects of Japan, Addit. II, p. 373 (*Rhaphiocera*); Lindner, 1938, Die Fliegen der Pal. Region, 18, p. 32.

Known only from Japan.

ACANTHASARGUS White

White, 1914, Pap. Roy. Soc. Tasmania, 1914-15:60; Hardy, 1932, Proc. Roy. Soc. Queensland, 44:48-9.

I have seen only one species (*A. varipes* Hardy); in it, the arista is well developed, the basal segments of the antennae are shorter than those of Lindner's illustration of *Rhaphiocerina*, vein R_4 is absent, and 2nd A is distinctly sinuate. Veins M_1, M_2, and M_3 as in *Rhaphiocerina*. In *A. varipes* there is a transverse white callus running from eye to eye above the antennae and separated from the rest of the front by a suture. In *Nothomyia* this raised area is present, but is indistinct and never white.

Genotype, *A. palustris* White, by monotypy.

The following four species are known, all from Australia:

A. palustris White, 1914, Pap. Roy. Soc. Tasmania, 1914-15:60. Tasmania.

A. gracilis White, 1916, Proc. Linn. Soc. N.S.W., 41:98. Australia.

A. flavipes Hardy, 1932, Proc. Roy. Soc. Queensland, 44:48. Queensland.

A. varipes Hardy, 1932, Proc. Roy. Soc. Queensland, 44:49. Queensland.

KEY TO THE SPECIES OF ACANTHASARGUS
(After Hardy)

1. Thorax and abdomen entirely black 2
–. Thorax and abdomen yellow in part 3
2. Scutellum and scutellar spines black ..... *palustris* White
–. Scutellum with a yellow bar between yellow scutellar spines ..... *gracilis* White
3. Scutellum and spines entirely yellow; legs almost entirely yellow ..... *flavipes* Hardy
–. Scutellum black, scutellar spines yellow; legs yellow with sections of the femora and tibiae black ..... *varipes* Hardy

MELANOCHROA Röder

Röder, 1886, Ent. Nachricht., 12:139; Brauer, 1882, Denkschr. Kais. Akad. Wiss. Wien., 44:69.

I have not seen any specimens of this genus but both Brauer and Williston have associated it with *Myxosargus*. Williston gives as the only generic characters separating *Melanochroa* and *Myxosargus* "the non-contiguity of the male eyes and the aristiform termination of the antennae." To this may be added that the face is not produced downward, as in *Myxosargus*. Williston did not consider this of generic value, because two species of *Euryneura* (which, incidentally, were later separated generically by Kertész) differ in this respect. I cannot agree with him, however. Generic characters must be determined separately in each instance. What is of generic value in one group may not be of even specific value in another. Failure to recognize this fact has contributed much to the artificiality of our generic and higher classifications.

Both Brauer and Röder attribute this genus to Schiner. However, the first description I can find is that of Röder. I am, therefore, following the lead of Williston and Kertész in crediting *Melanochroa* to Röder. Brauer, to be sure, placed it in his key, but without a description of the type species and on the basis of the erroneous statement (at least according to the descriptions of Röder and Williston) that the eyes of the male are contiguous.

Both Brauer and Röder state that the flagellum of the antennae is eight-segmented. This is contrary to the condition which I have found in related genera.

MELANOCHROA DUBIA Röder

Röder, 1886, Ent. Nachricht., 12:139; Williston, 1888, Trans. Amer. Ent. Soc., 15:254.

The only species was described from Brazil and subsequently recorded from Rio de Janeiro by Williston.

NOTHOMYIA Loew

Loew, 1869, Cent., VIII, 4; Brauer, 1882, Denkschr. Kais. Akad. Wiss. Wien., 44:69; Enderlein, 1914, Zool. Anz., 44:15; James 1935, Canad. Ent., 67:269; 1939, Proc. U. S. Nat. Mus., 86:597.
Berisargus Lindner, 1933, Rev. de Ent., 3:201.

The position of this genus in the system of classification has been the subject of considerable dispute. Loew originally placed it in the Geosarginae, but stated that it was intermediate between *Michrochrysa* and *Oxycera*. Most authors have accepted this disposal. Lindner placed *Berisargus* in the Geosarginae in accordance with what he called our artificial system of classification, but associated it more closely with the Beridinae. What his reasons for this association were, he did not say.

Too much emphasis should not be placed on the differences in antennal structure in this genus and in *Myxosargus*. For instance, a well graded series can be found ranging from typical *Myxosargus* antennal structure through *Berisargus lopesi*, *B. fasciatipennis*, *B. borgmeieri*, *Nothomyia calopus*, and *N. scutellata*.

The difference in facial profile of *Nothomyia* and *Myxosargus* has also been taken to be of generic value; yet *M. knowltoni* might be considered intermediate in position in this respect. Furthermore, *Myxosargus* has banded wings; *Nothomyia* may have more or less darkened wings, yet those of *Berisargus fasciatipennis* are described as banded.

Genotype of *Nothomyia*, *N. scutellata*, by designation of Brauer, 1882; of *Berisargus*, *B. borgmeieri*, by monotypy.

KEY TO SPECIES OF NOTHOMYIA

1. Wings brownish-gray, with three milky-white cross-bands..... ..... *fasciatipennis* Lindner
–. Wings more or less uniformly hyaline or light brownish, not definitely cross-banded 2
2. Scutellar spines reduced to tubercles or very short, much shorter than half the distance between them..... 3
–. Scutellar spines of ordinary length, that is, definitely longer than half the distance between them..... 4
3. Scutellum yellow, black at base; spines short, but distinct; femora black, with more or less of a greenish cast.... *scutellata* Loew
–. Scutellum metallic green; spines reduced to tubercles; femora metallic green ..... *intensica* Curran
4. Femora on apical third bright yellow..... *calopus* Loew
–. Femora black 5
5. Flagellum of antenna very short, bright yellow.. *parvicornis* James
–. Flagellum of antenna black or blackish..... 6

6. Terminal antennal segment thick and ribbon-like at base, suddenly narrowing to a bristle-like part before its middle; scutellar spines robust, blunt, black ..... *nigra*, n. sp.
–. Terminal antennal segment an arista, or, if thickened at base, gradually tapering to a bristle-like part; scutellar spines slender, sharp, yellow 7
7. Antenna with a well-differentiated arista, the thickened portion of the flagellum shorter than antennal segments one and two combined; vein R_4 wanting 8
–. Terminal segments of flagellum not arista-like, and its basal portion as long or longer than segments one and two combined; halteres yellow 9
8. Pile of face black in the middle or largely black; pleura greenish ..... *borgmeieri* Lindner
–. Pile of face white; pleura black ..... *viridis* Hine
9. Vein R_4 wanting; halteres infuscated in male, distinctly brownish-black ..... *lopesi* Lindner
–. Vein R_4 present; halteres yellow ..... *longisetosa* Lindner

Nothomyia fasciatipennis Lindner

Berisargus fasciatipennis Lindner, 1935, Rev. de Ent., 5:401.

Known only from the male type, from Jussaral, Angra, E. do Rio, Brazil.

Nothomyia scutellata Loew

Loew, 1869, Cent., VIII, 4.

Type series from Cuba. My records are all from Cuba: 1♂, 1♀, Guantanamo, May 7, 1914 (C. T. Ramsdan); 2♀, Loma del Gato, Cobre Range, Ote., 3000 feet, July 3-7, 1936 (Darlington); 1♀, Mountains north of Imias, Eastern Oriente, 3000 to 4000 feet, July 25-28, 1936 (Darlington); 1♂, Buenos Aires, Trinidad Mountains, May 4, 1932 (S. C. Bruner, A. Otero); 1♂, Rio Almendares, May 27, 1934 (L. C. Scaramuzza); 2♂, Santiago de las Vegas, Habana, May 11, 1924 (S. C. Bruner) and May 19, 1932 (A. R. Otero).

Nothomyia intensica Curran

Merosargus intensicus Curran, 1928, in Gowdy, Ent. Bul. Dept. Agr. Jamaica, 4:33.

This species has the general body form and wing venation of a *Nothomyia*. The antennae are wholly black; the basal three segments of the flagellum (thickened part) are slightly shorter, taken together, than the first two antennal segments combined; the arista is long. Body metallic green, the dorsal parts with a strong purplish cast; legs black; middle and hind basitarsi, except apices,

white; femora with a metallic green cast. M_1 and M_3 developed only on basal third or less.

Curran probably placed this species in *Merosargus* because of the apparently unspined scutellum; however, other characters suggest *Nothomyia*, and evidences of spines are seen in the broad, thick, fused tubercles at the apex of the scutellum.

I have seen four males, Bath, Jamaica, April 1, 1931 (E. L. Bell), and 1 ♂, Balaclava, Jamaica (A. E. Wright).

Nothomyia calopus Loew

Loew, 1869, Cent., VIII, 5.

Type, female, Cuba. I have the following records. Florida: 1 ♂, Hudson, July 13, 1939 (P. B. Lawson). Cuba: 1 ♀, Santiago de las Vegas, March 4, 1932 (A. Otero); 1 ♀, Baraqua, August 12, 1927 (L. C. Scaramuzza).

Nothomyia parvicornis James

James, 1939, Proc. U. S. Nat. Mus., 86:598.

Holotype, male, San Carlos, Costa Rica.

Nothomyia nigra James, new species

Female. Head shining black; front, vertex, and post-ocular orbits with bluish-green reflections. Ocular orbits on each side above antennae with a silvery-pollinose patch. Pile of face and lower part of front black, that of rest of head golden; some black pile on front, and there may be some golden on face; that of lower part of head dense and conspicuous. Antennae black; ratio of segments 8:8:5:3:3:3:5;22; pile on first two black, on others white and inconspicuous; segments three to six robust; seven less than half as wide (from front view) as six; eight as wide at base as width of seven, but suddenly narrowing just before middle to an aristiform style. Thorax, including scutellum and spines, black, shining but reflection somewhat dulled on dorsum; spines thick, blunt, short, about one-third length of scutellum, each two-thirds distance between them; scutellum unusually large, its length, excluding spines, one-third that of dorsum; pile of thorax wholly golden. Legs black with golden pile, only middle and hind basitarsi, except apices, yellow. Halteres yellow. Wings hyaline, veins yellow; R_{2+3} arising slightly before and ending slightly beyond apex of discal cell; M_3 evanescent on apical third. Abdomen wholly black, with golden pile. Length, 6 mm.

Holotype, female, No. 25662, Museum of Comparative Zoology, and paratype, female, Valla Nuevo, S. E. Constanza, Dominican Republic, 7000 feet, August, 1938 (Darlington).

NOTHOMYIA BORGMEIERI Lindner

Berisargus borgmeieri Lindner, 1933, Rev. de Ent., 3:202.

Types from Alto da Serra, São Paulo, Brazil. I have two pairs from Jussaral, Angra, E. do Rio, October, 1934 (Travassos and Lopes) and October 26, 1935 (Lopes and H. Lent), compared with the types by Dr. Hugo de Sousa Lopes.

NOTHOMYIA VIRIDIS Hine

Hine, 1911, Ohio Nat., 11:301.

Described from Sandusky, Ohio, and recorded by James (Proc. U. S. Nat. Mus., 86:598) from Puerto Rico.

NOTHOMYIA LOPESI Lindner

Berisargus lopesi Lindner, 1935, Rev. de Ent., 5:401.

Types from Jussaral, Angra dos Reis, E. do Rio, Brazil. I have two pairs from the type locality and from Japuhyba, Angra, E. do Rio, October, 1934 (Travassos and Lopes), compared with the types by Dr. Lopes. Also 1 ♂, Juquia, São Paulo (John Lane).

NOTHOMYIA LONGISETOSA Lindner

Berisargus longisetosus Lindner, 1933, Senckenbergiana, 15:328.

Type, male, Itatiaya, Brazil.

MYXOSARGUS Brauer

Brauer, 1882, Denkschr. Akad. Wiss. Wien., 44:77; Enderlein, 1914, Zool. Anz., 43:612; Curran, 1929, Amer. Mus. Nov., 378, p. 1-4.

Eyes contiguous in the male, separated in the female; antennae eight-segmented, the first and second segments subequal in length or the first the longer; third to fifth compact, but distinctly separated from each other; sixth, seventh, and eighth forming a style, the eighth segment the longest. Face prominent, the antennae situated at its upper angle; below, the face projects below the level of the oral margin. Discal cell rather small. Vein R_{2+3} arising beyond cross-vein r–m, which is distinct, although sometimes short; R_4 wanting. Wings cross-banded with blackish.

Eight species have been previously known, four of them from one sex only. So far as known, the genus is confined to the tropical and warmer temperate regions of the New World.

Genotype, *Myxosargus fasciatus* Brauer, by original designation.

The following keys are based, with additions and emendations, on that of Curran's review cited above.

Key to the Species of Myxosargus

Females

1. Middle and hind femora broadly yellow at base ..... *scutellatus* Williston
–. Middle and hind femora black on basal half or more 2
2. Antennae wholly black 3
–. Antennae reddish or yellowish on at least basal two segments .. 4
3. Base of scutellum black; all tibiae broadly yellow at apex ..... *nigricornis* Greene
–. Scutellum wholly yellow; front tibiae entirely black ..... *knowltoni* Curran
4. Front with a median and two lateral tubercles .. *fasciatus* Brauer
–. Front with only one tubercle 5
5. Scutellum black with yellow border ..... *braueri* Williston
–. Scutellum yellow 6
6. Frontal tubercle geminate, longitudinally divided; knobs of halteres yellow 7
–. Frontal tubercle not divided, rather small; knobs of halteres brown ..... *texensis* Curran
7. Hind tibiae wholly brown or black; black pile on facial snout dense, bushy, upcurved ..... *pilosus*, n. sp.
–. Hind tibiae broadly yellow at apex; black pile on facial snout ordinary ..... *panamensis* Curran

Males

1. Antennae wholly black 2
–. Antennae reddish or yellow on at least basal two segments 3
2. Apical half of middle tibiae yellow; pile of mesonotum black ..... *nigricornis* Greene
–. Middle tibiae black except extreme apex; pile of mesonotum yellowish ..... *knowltoni* Curran
3. Front black with two chalk-white marks at base of antennae ..... *fasciatus* Brauer
–. Front at most obscurely reddish at base of antennae 4
4. Apices of all tibiae broadly yellow or yellowish .. *texensis* Curran
–. At least hind tibiae wholly black or nearly so 5
5. Anal cell more or less strongly clouded with brown; middle of mesonotum with yellow pile 6
–. Basal half of wing hyaline; pile of thorax grayish white ..... *grypus* Enderlein
6. Facial pile all black or blackish, that of snout dense, bushy, upcurved ..... *pilosus*, n. sp.
–. Facial pile yellow, except on apex of snout, ordinary ..... *panamensis* Curran

MYXOSARGUS NIGRICORNIS Greene

Greene, 1918, Proc. Ent. Soc. Wash., 20:71.

The original spelling, *nigricormis*, was a typographical error. The facial projection is prominent and forms an acute angle, when viewed from the side. Type series from Chain Bridge, D. C., and Plummer's Island, Md. I have identified a male from Logan County, Ohio, July 12, 1930 (James S. Hine).

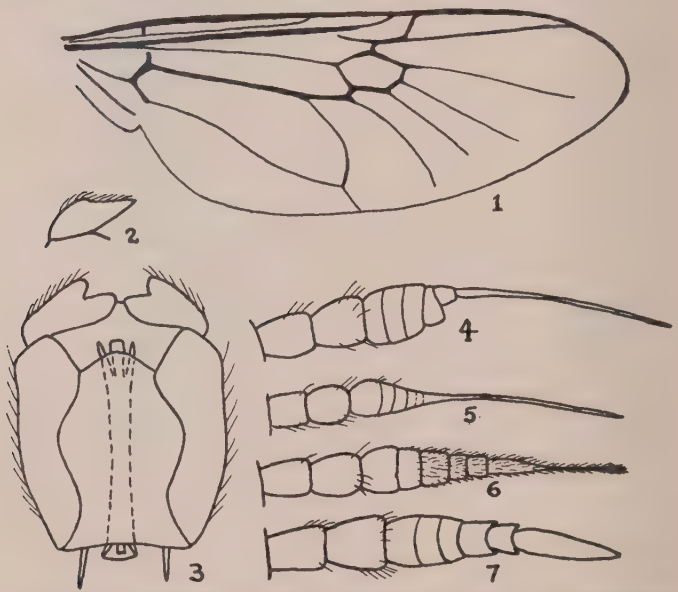


Fig. 1, *Nothomyia calopus* Loew, wing. Fig. 2, *Myxosargus knowltoni* Curran, dististylus of male genitalia. Fig. 3, *Myxosargus pilosus* James, n. sp., male genitalia. Fig. 4, *Nothomyia scutellata* Loew, antenna. Fig. 5, *Nothomyia borgmeieri* Lindner, antenna. Fig. 6, *Nothomyia lopesi* Lindner, antenna. Fig. 7, *Myxosargus knowltoni* Curran, antenna.

MYXOSARGUS KNOWLTONI Curran

Curran, 1929, Amer. Mus. Nov., 378, p. 2.

Differs from other species known to me in the profile of the facial projection, which forms a decidedly obtuse angle below, in both sexes. Type locality, Clearfield, Utah.

I have seen numerous specimens from various localities in Utah, from the Idaho line to St. George, and from April to August. Other records are as follows. Idaho: Franklin, July 9,

1937 (C. F. Smith, F. C. Harmston), and July 17, 1937 (Knowlton and Smith); Preston, July 4, 1937 (Smith and Harmston) and July 2, 1937 (Knowlton). Oregon: Phoenix, July 13, 1930 (Scullen). California: Big Pine, Inyo County, June 17, 1929 (E. P. Van Duzee); Lone Pine, Inyo County, June 1, 1937 (N. W. Frazier); Los Angeles, May, 1915 (M. C. Van Duzee) and August 3, 1916.

Myxosargus texensis Curran

Curran, 1929, Amer. Mus. Nov., 378, p. 4.

Male (previously undescribed). Scutellum greenish-black like thorax, only apex, lateral margins, and spines being yellow. Middle and hind femora wholly black. Differs from female otherwise only in sexual characters.

Male, Menard County, Texas, July 19, 1928 (R. H. Beamer).

Myxosargus pilosus James, new species

Male. Head black, shining; two oval silvery-pollinose spots, almost touching each other, on upper part of front; face acutely produced below the oral margin. Pile of head dense, especially below, black with a few pale hairs intermixed, the black pile of front, face, and cheeks half again to twice as long as first antennal segment. Antennae yellow on first two segments, yellowish to brownish at base of flagellum, grading to brown on its terminal segments. Proboscis yellow. Thorax black with a distinctly green cast, the narrow apex and spines of the scutellum yellow; pile comparatively abundant and for the most part as long as that of head, that on middle of dorsum and scutellum yellow, erect, conspicuous, and long, that on sternum and lower parts of pleura yellow and less conspicuous, that on sides of dorsum, metanotal slopes, and upper parts of pleura black. Legs black; extreme tips of front femora and tibiae, apical third to half of middle tibiae, and basal two to three segments of middle and hind tarsi, yellow. Halteres yellow. Wings with usual two dark cross-bands; discal cell rather short and blunt. Abdomen black, yellow-pilose with considerable black pile intermixed, especially on dorsum and sides of basal segments. Genital dististyli broad, bilobed at apex, the lobes blunt, the inner one the broader. Length, 6 mm.

Female. Pile of head no longer than first antennal segment; that of front, vertex, and upper part of face whitish. Front with a median rather indistinctly geminate tubercle. Pile of thorax and abdomen entirely whitish. Scutellum entirely yellow. Hind tibiae briefly yellow at apex. Otherwise as in male.

Holotype, male, University of Arizona collection, allotype, female, and ten male paratypes, Tempe, Ariz., May 17, 1926 (A. A. Nichol); paratype, female, Juan Mina, Rio Chagres, C. Z., April 11 (C. B. Fairchild).

Myxosargus pilosus guatemalae James, new subspecies

Differs from the typical subspecies mainly in that the black areas tend to be brownish; the abdomen, in both sexes, is distinctly brownish and lacks black pile; the pile of the metanotal slopes, in the male, is predominantly yellow.

Holotype, male, Ohio State University collection, Amatitlan, Guatemala, Feb. 7, 1905 (J. S. Hine), allotype, female, and paratype, female, Gualan, Guatemala, Feb. 13, 1905.

MYXOSARGUS PANAMENSIS Curran

Curran, 1929, Amer. Mus. Nov., 378, p. 4.

Type series from Barro Colorado Id., Ft. Davis, and Corozal, C. Z., and Panama City. I have identified a female from Mira Flores Locks, C. Z., Jan. 17, 1929 (C. H. Curran).

I have no additional records for the following species belonging to this genus:

M. scutellatus Williston, 1901, Biol. Centr. Amer. Dipt., I, p. 251; Curran, 1929, Amer. Mus. Nov., 378, p. 2. Mexico.

M. fasciatus Brauer, 1882, Denkschr. Akad. Wiss. Wien., 44:78; Giglio-Tos, 1901, Mem. Acad. Sci. Nat. Torino, 431:109; Williston, 1901, Biol. Centr. Amer. Dipt., I, p. 251; Curran, 1929, Amer. Mus. Nov., p. 2. Mexico.

M. braueri Williston, 1888, Trans. Amer. Ent. Soc., 15:254; Curran, 1929, Amer. Mus. Nov., 378, p. 4. Brazil.

M. grypus Enderlein, 1914, Zool. Anz., 43:612; Curran, 1929, Amer. Mus. Nov., 378, p. 3. Mexico.

LITERATURE CITED

Brauer, Friedrich, 1882, Die Zweiflügler des kaiserlichen Museums zu Wien. II. Denkschr. Kais. Akad. Wiss. Wien., 44:59-89.

Lindner, Erwin, 1938, Die Fligen der Palaearktischen Region, 18. Stratiomyidae. Erwin Nägele, Stuttgart.

Séguy, E., 1926, Faune de France, 13 Diptères (Brachycères). Paul Lechevalier, Paris.

Verrall, G. H., 1901, British Flies, V, Stratiomyidae, etc. Gurney and Jackson, London.

DESCRIPTIONS, RECORDS AND SYSTEMATIC NOTES CONCERNING WESTERN NORTH AMERICAN STONEFLIES (Plecoptera)

BY T. H. FRISON
Illinois Natural History Survey, Urbana

(*Continued from January issue*)

Capnia melia Frison, new species

Figures 5a-5c

Male. Body and appendages brown to black. No gill remnants. Head much wider than pronotum; lateral ocelli about three times as far apart as distance from inner margins of compound eyes; median ocellus about as far forward from lateral ocelli as distance between them; maxillary palpi less than thickness of basal flagellar segments.

Pronotum slightly wider than long, with a distinct median longitudinal line or space; embossings present. Wings extending beyond tip of abdomen, uniformly hyaline; radius of forewing sinuate at origin of radial sector.

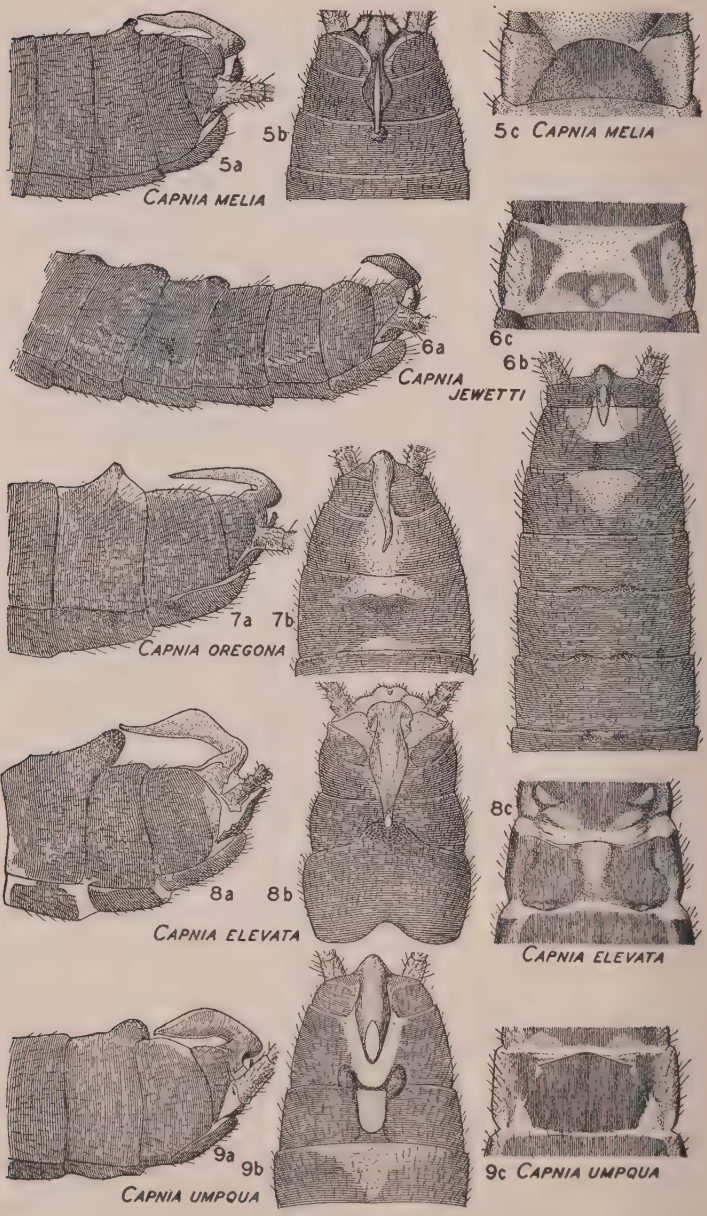
Abdomen with first seven segments without special structures; a narrow, membranous, median, longitudinal stripe on first few basal tergites; eighth tergite with a small, raised, slightly rearward-directed, knoblike structure or tubercle, figs. 5a and 5b; supra-anal process shaped as in figs. 5a and 5b, and extending to knob-like structure on eighth tergite. Ninth sternite without a lobe at the base. Cerci long, many segmented.

Length of body, 5 mm.

Female. Similar in most morphological features to the male. Eighth abdominal sternite, fig. 5c, forming a subgenital plate, with its posterior margin slightly curved. A broad, membranous, median stripe extends longitudinally across tergites one through eight.

Holotype, male, Clackamus County, Oregon, Wildcat Creek tributary of Sandy River, Feb. 3, 1939, S. G. Jewett, Jr. Allotype, female, same data as for holotype.

Paratypes all from Oregon: same data as for holotype, 39♂ and 24♀; same data as for holotype, except from Cedar Creek, 9♂ and 11♀; same data as for holotype, except from Alder Creek, 4♂ and 5♀; Clatsop County, tributary of Mecanicum River, 6 miles south of Seaside, Feb. 18, 1939, 1♂; Clatsop County, Big Creek, Feb. 19, 1939, 1♂; Columbia County, Gnat Creek, Feb. 19, 1939, 5♂; Benton County, Yew Creek, Jan. 31, 1938, 5♂. All specimens collected by S. G. Jewett, Jr. Paratypes in collection of Illinois Natural History Survey and S. G. Jewett, Jr.



Figures 5–9. Western North American Stoneflies.

This is a very distinctive species, which runs in the key to species, males only, of the genus *Capnia* in Needham & Claassen (1925) to *nearctica* Banks. It differs from *nearctica* in the male most noticeably by the shape of the supra-anal process and the form of the tubercle on the eighth tergite. It should be noted here that the figure for *nearctica* given by Needham & Claassen shows a raised tubercle on what seems to be the seventh abdominal tergite, whereas the description and key refer to this process as on the eighth tergite.

Capnia jewetti Frison, new species

Figures 6a-6c

Similar in general features to *Capnia melia* Frison. Differs from this and other species of the genus as follows:

Male. Abdomen, figs. 6a and 6b, with first three segments without special structures; fourth, fifth and sixth tergites each with a pair of small, raised tubercles on posterior margin of segment, the ones on fifth and sixth larger than those on fourth; no tubercles on seventh, eighth or ninth tergites, but median posterior portions of eighth and ninth somewhat membranous; supra-anal process short, somewhat pointed, with apex on upper side slit or with an opening. Ninth sternite without a lobe at base.

Female. Similar in most morphological features to the male. Eighth abdominal sternite with weakly and strongly sclerotized areas as in fig. 6c. A broad, membranous, median stripe extends longitudinally across tergites one through eight.

Holotype, male, Benton County, Oregon, 14 miles south of Corvallis, Muddy Creek, Feb. 10, 1938, S. G. Jewett, Jr. Allotype, female, same data as for holotype.

Paratypes all from Oregon: same data as for holotype, 6♂; St. Helens, Columbia County, Tide Creek, Feb. 19, 1939, 1♂, 1♀; Columbia County, Gnat Creek, Feb. 19, 1939, 1♂. All specimens collected by S. G. Jewett, Jr. Paratypes in the collections of the Illinois Natural History Survey and S. G. Jewett, Jr.

Capnia oregona Frison, new species

Figures 7a-7b

Similar in general features to *Capnia melia* Frison. Differs from this and other species of the genus as follows.

Male. Abdomen, figs. 7a and 7b, with first seven segments with-

out special structures; eighth tergite with a small, narrow, median, transverse ridge on posterior part, ninth and tenth tergites with membranous area in central area; supra-anal process distinctly curved, viewed from above, pointed and extending part way over ninth tergite.

Holotype, male, Benton County, Oregon, 14 miles south of Corvallis, Muddy Creek, Feb. 10, 1938, S. G. Jewett, Jr.

Paratypes all from Oregon: same data as for holotype, 3♂; St. Helens, Columbia County, Milton Creek, Feb. 19, 1939, S. G. Jewett, Jr., 1♂; Corvallis, March 11, 1935, K. Gray, 1♂. Paratypes in the collections of Illinois Natural History Survey, Oregon State College and S. G. Jewett, Jr.

Capnia elevata Frison, new species

Figures 8a-8c

Similar in general features to *Capnia melia* Frison. Differs from this and other species of the genus as follows.

Male. Wings very short, not extending beyond first segment, venation poorly developed.

Abdomen, figs. 8a and 8b, with first six segments without special structures; seventh tergite with a rearward projecting hump on middle portion of posterior margin, surface of hump somewhat granulate; eighth and ninth tergites without special structures except that median portion of ninth is more weakly sclerotized; supra-anal process enlarged beyond base and then tapering to a point, decidedly thickened through part at greatest width, tip normally resting under hump of seventh tergite. Ninth sternite without a lobe at base.

Female. Similar in most morphological features to the male. Wings not extending beyond eighth segment, radius of forewing sinuate at point of origin of radial sector. Eighth abdominal sternite with a narrow, light colored, longitudinal stripe and with posterior margin almost straight, as in fig. 8c. A broad, membranous, median stripe extends longitudinally across tergites one through at least part of seven.

Holotype, male, Corvallis, Oregon, Marks Creek, Feb. 26, 1938, Ball & White. Allotype, female, same data as for holotype.

Paratypes: same data as for holotype, 6♂, 3♀. Paratypes in collections of Illinois Natural History Survey and Oregon State College.

This species will run in the key to males of the genus *Capnia* in Needham & Claassen (1925) to the species *decepta* Banks

known to date only from Colorado. The short wings of both sexes, the more pointed supra-anal process of the male, the heavily sclerotized eighth abdominal tergite and the light-colored median, longitudinal stripe on the eighth sternite of the female, all suggest the specimens here recorded are distinct from *decepta*.

Capnia umpqua Frison, new species

Figures 9a-9c

Similar in general features to *Capnia melia* Frison. Differs from this and other species of the genus as follows:

Male. Abdomen, figs. 9a and 9b, with first seven segments without special structures; eighth tergite with a deeply incised, membranous area extending from middle portion of posterior margin almost to anterior margin of segment, a prominent lobe or tubercle on posterior margin of sclerotized portion of segment and adjacent to the membranous area; ninth tergite with middle area membranous except at extreme anterior margin; supra-anal process rather short and extending part way over ninth tergite, somewhat tubular with a slit or opening near pointed tip. Ninth sternite without a lobe at base.

Female. Similar in most morphological features to the male. Eighth abdominal sternite with posterior margin slightly produced, as in fig. 9c. A broad, membranous, median stripe extends longitudinally across tergites one through eight.

Holotype, male, Douglas County, Oregon, Umpqua River, February 21, 1939, S. G. Jewett, Jr. Allotype, female, same data as for holotype.

Paratypes all from Oregon: same data as for holotype, 7♂, 5♀. Paratypes in the collections of Illinois Natural History Survey and S. G. Jewett, Jr.

Capnia tumida Claassen

Figures 10a-10c

Capnia tumida Claassen. 1924. Can. Ent. 56:47.

Female. Similar in most morphological features to the male as described by Claassen (1924). Important features of the heretofore undescribed female are as follows: Eighth abdominal sternite forming a slightly projecting subgenital plate shaped as in fig. 10a, this area being continuously fused with the sclerotized area of the seventh sternite; a broad, membranous, median stripe extends longitudinally across tergites one through seven, and most of eight.

Allotype, female, Portland, Oregon, Johnson Creek at 82nd Street, Feb. 3, 1939, S. G. Jewett, Jr.

Associated with the specimen designated as the allotype are 5♂ and 1♀. Because this species has not been recorded since the time of its original description the following additional records for both sexes are presented: Corvallis, Oregon, March 5, 1938, 1♂, Don Coons; Oak Creek, Jan. 23 and 30, 1935, 2♂, March 1, 1935, 1♂, R. W. Prentiss; Dixon Creek, Jan. 19, 1935, 2♂; March 11, 1935, 1♀, K. Gray; March 6, 1936, 1♀, S. G. Jewett, Jr.; Oak Creek, March 27, 1937, 1♀, S. G. Jewett, Jr.; March 6, 1938, 11♀, Bolinger & Jewett; McFaddens Lake, Benton County, Jan. 12, 1938, 1♀, E. E. Crawford; Wrens, Benton County, Mary's River, March 19, 1933, 2♀, R. Dimick; Portland, Oregon, Johnson Creek at Errol Station, Feb. 3, 1939, 2♂.

Additional illustrations, figs. 10b and 10c, of the male are given to facilitate identification of this species.

Capnia nana Claassen

Figure 11

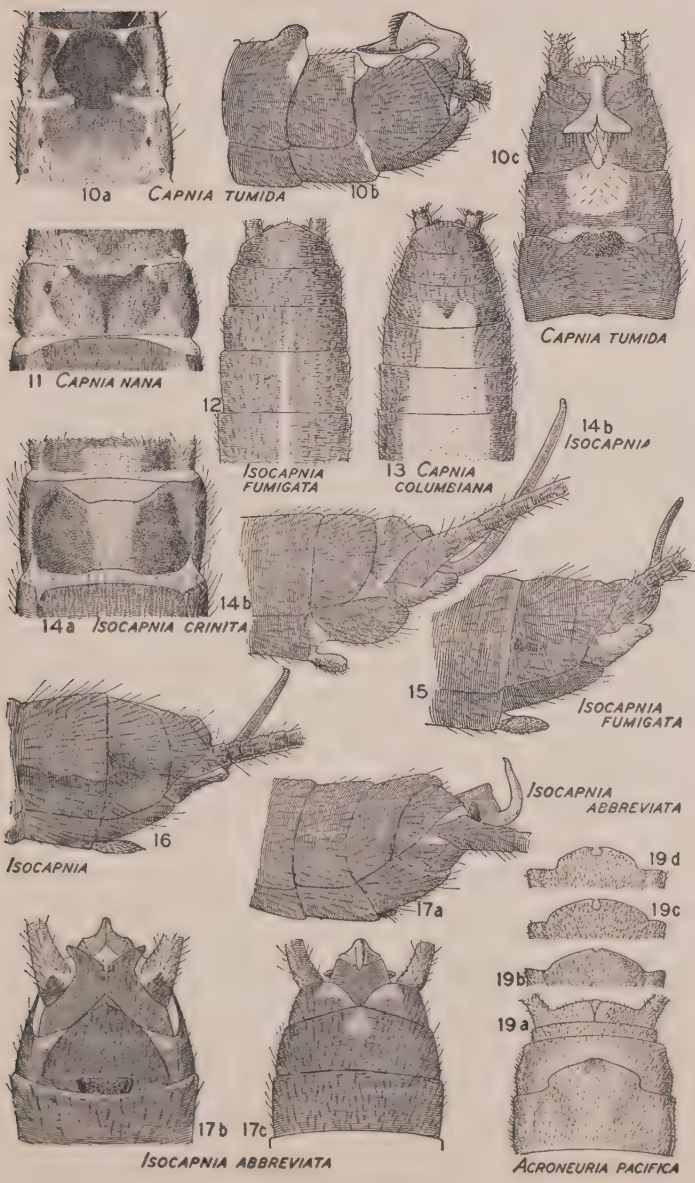
Capnia nana Claassen. 1924. Can. Ent. 56:46.

Female. Similar in most morphological features to the male as described by Claassen (1924). Important features of the heretofore undescribed female are as follows: Eighth abdominal sternite, fig. 11, forming a weakly-developed subgenital plate, posterior margin and median longitudinal area darkest and most heavily sclerotized; a broad, membranous median stripe extends longitudinally across tergites one through eight; wings slightly extending beyond tip of abdomen.

Allotype, female, Terrace, B. C., 1936, Mrs. M. E. Hippisley.

Associated with the specimen designated as the allotype are 9♂ and 6♀. It should be noted that the allotype and associated specimens come from the exact locality of the original typic specimens, collected 13 years earlier.

Because this species has not been recorded since the time of its original description the following distributional records are presented: Logan Canyon, Utah, April 3, 1938, 27♂, 17♀; Mar. 20, 1938, 2♂; Jan. 15, 1938, 5♂, 3♀; Feb. 20, 1938, 1♀; Feb. 26, 1938, 1♀; all collected by William P. Nye. Smithfield Canyon, Utah, March 19, 1939, 4♂, 4♀, Nye, Harmston & Knowlton; Logan Canyon, Beaver Creek, Utah, April 19, 1940, 1♂, 1♀,



Figures 10–19. Western North American Stoneflies.

William P. Nye. These Utah specimens differ from the typical *nana* from British Columbia chiefly in that wings of the males are greatly reduced in size and that the females vary from short- to long-winged forms. Such a brachypterous condition is encountered in stoneflies of varied genera from time to time.

Isocapnia Banks

Isocapnia Banks. 1938. Psyche 45(1):73.

Banks (1938) has recently proposed the generic name of *Isocapnia* for *Capnia crinita* N. & C., figs. 14a and 14b, a new species called *fumosa*, and *Arsapnia grandis* Banks, the last being made the genotype. Whether this group of western capniids is entitled to full generic status is a matter of opinion. Temporarily, at least, I am accepting *Isocapnia* as a generic name for those capniid species having the following characters: radius straight at point of origin of radial sector in forewing; mostly large species; tendencies for several costal crossveins; long, many-segmented anal cerci; females with a very narrow, median, longitudinal membranous stripe extending across abdominal tergites one through eight; and males with a lobe at the base of the ninth abdominal sternite.

The presence of a lobe at the base of the ninth abdominal sternite in the male is a very important character of *Isocapnia* and surprisingly it was not reported for any North American capniid males until Claassen (1937) described *Capnia fumigata*, fig. 15, which belongs in *Isocapnia*. A study of the typic male specimen of *grandis* Banks reveals the presence of this lobe, and it is conspicuous also in all other males of this genus which I have examined. The narrow, longitudinal, membranous, dorsal abdominal stripe, fig. 12, of the females of *Isocapnia*, in contrast to the broad stripe of the females of *Capnia*, fig. 13, has not been noted before, but is conspicuous and highly distinctive.

I am indebted to Dr. Nathan Banks of the Museum of Comparative Zoology, Cambridge, Mass., for the privilege of studying the types of *A. grandis* Banks and *I. fumosa* Banks and to Dr. Henry Dietrich of Cornell University, Ithaca, N. Y., for the same privilege in the case of *C. crinita* N. & C. and *C. fumigata* Claassen.

The actual number of species belonging to *Isocapnia* presents a problem impossible of solution at present. Only a few speci-

mens of the genus are as yet represented in collections and most of these involve typic specimens assigned specific names without much comparative study. Further comments concerning this problem are given in connection with my remarks about *crinita* (fig. 14a), *fumigata* (fig. 15) and *grandis* and the species proposed as new in this paper.

Isocapnia grandis (Banks)

Arsapnia grandis Banks. 1908. Can. Ent. 37:329.
Capnia grandis Needham & Claassen. 1925. Monograph of Plecoptera of America North of Mexico, Thomas Say Foundation, 2:259.

The original typic series (M.C.Z. No. 11365) includes a male from "Victoria, B. C., Ap. 12-1907" and a female from "Banff, Alberta, June 17, 1901." Since the proper association of males and females in this group is still conjectural, it seems highly desirable to establish a single specimen for nomenclatorial reasons and accordingly I am selecting the male specimen to be known as the *lectotype*. This male has a supra-anal process which is somewhat recurved backward beyond its middle (pl. 48, fig. 6, Needham & Claassen 1925).

The female in the original typic series may or may not be the female which properly belongs with the typic male, although it definitely belongs to *Isocapnia*. This female has a subgenital plate suggestive of *crinita* N. & C.

Isocapnia crinita (Needham & Claassen)

Figure 14a

Capnia crinita Needham & Claassen. 1925. Monograph of Plecoptera of America North of Mexico, Thomas Say Foundation, 2:269.

The original description of this species, based upon a female specimen, contains a brief comment concerning the shape of the subgenital plate, but, contrary to the procedure followed in the case of other species treated, contains no illustration. During a recent study of the holotype, in poor condition, from "Montana Experiment Station, Bozeman, Montana, May 12, 1917, R. A. Cooley," a drawing was made of the subgenital plate, and it is reproduced here, fig. 14a, to aid with the future recognition of this species.

The holotypic female of *crinita* (N. & C.) and the allotypic female of *fumigata* appear upon the basis of the subgenital area to represent two distinct species; the posterior margin of the eighth abdominal sternite of the latter showing a distinct process which is deeply recessed or cleft (Pl. 3, fig. 5, Claassen 1937, p. 78), whereas in *crinita* this margin is not recessed. It remains to be proved whether the differences observed and here reported are good criteria for the separation of *crinita* from *fumigata*.

The impossibility at present of properly or definitely assigning males with females and the number of actual species in *Isocapnia* have been mentioned elsewhere in this paper.

Dr. W. E. Ricker has collected and sent to me from "Agassiz, B. C., Fraser River, April 24, 1938," a female which has the subgenital plate not recessed, and therefore it is in agreement with the holotypic female described as *crinita*. This female is smaller than those considered as *fumigata* and the wings are more hyaline. Collected at the same time and place are two small males, also from Dr. Ricker, which in general are similar to *grandis*, but the supra-anal process, fig. 14b, in each specimen is arched forward and not recurved backward beyond its middle, and both pairs of wings are weakly developed. It is possible that these brachypterous males are distinct from *grandis* and represent the male which goes with *crinita*. On the other hand, it is also possible that these differences represent merely variations.

In the Illinois Natural History Survey collection are three females and one male of *Isocapnia* from Utah which further complicate the situation and suggest that *grandis* may be an extremely variable species. The male differs from males which I now recognize as *grandis* and *crinita* in having the supra-anal process straight, fig. 16. Two of the females seem, on the basis of the subgenital plate, best to fit *crinita*, but one suggests *fumigata*.

Isocapnia fumigata (Claassen)

Figures 12, 15

Capnia fumigata Claassen. 1937. Can. Ent. 69:79.
Isocapnia fumosa Banks. 1938. Psyche 45(1):74. *New synonymy.*

A study of the allotypic female of *Capnia fumigata* Claassen (1937) and the two cotypic specimens (M.C.Z. No. 22661) of

Isocapnia fumosa Banks (1938) leads me to the conclusion that these two are of the same species, the name *fumigata* having priority. The subgenital plate of *fumosa* agrees very well with that of *fumigata* and no differences of any kind were observed. Both species were described from specimens collected in Oregon.

The typic series of *fumosa* Banks (M.C.Z. No. 22661) contains two specimens. One of these from "Ore. Nat. Forest, Herman, Oregon, IV-18-20, 700′ alt., A. C. Burrill coll.," was relaxed and the subgenital region carefully studied while in fluid. I am designating this particular specimen as the *lectotype* for obvious nomenclatorial reasons.

I have before me, collected and kindly sent to me by Dr. W. E. Ricker, a male and a female from "Cultus Lake, B. C., 25-IV-37" and another male and female from "Agassiz, B. C., Fraser River, April 24, 1938," which I accept as *fumigata*. Both of these females have the subgenital plate similar to *fumigata* as figured by Claassen (1937, fig. 7) and the males have the supra-anal process, fig. 15. slightly curved backwards beyond the middle and about similar in comparative length to that in the illustration of *fumigata* by Claassen (1937, fig. 4).

The similarity of these males to *grandis*, as described and illustrated by Needham & Claassen (1925, pl. 48, fig. 6), suggest that *fumigata* is a synonym of *grandis*. Claassen in describing the male of *fumigata* states it "is very closely allied to *Capnia grandis* Banks, but differs in the structure of the supra-anal process which in *fumigata* is shorter and a little more slender than in *grandis*." I hesitate, however, to propose this synonymy until conclusive evidence has been obtained from the study of more material.

Isocapnia abbreviata Frison, new species

Figures 17a-17c

Similar in most general features to *Isocapnia grandis* (Banks). Differs from this and other species of the genus as follows.

Male. Very small for this genus, 9 mm. to tip of wings. Abdomen, figs. 17a and 17b, with first nine segments without special structures; supra-anal process small, very short, about equal to first tarsal segment in length, and gradually tapering to a point; ninth sternite, fig. 17c, with a small lobe at middle of basal margin.

Holotype, male, Benton County, Oregon, Oak Creek, Feb. 26, 1938, S. G. Jewett, Jr.

Paratype, male, Scranton, California, Waddell Creek, April 16, 1933, F. H. Sumner. Deposited in the collection of the Academy of Natural Sciences of Philadelphia, Philadelphia, Pa.

This species is very closely related to *Isocapnia grandis* Banks (1908). Major points of similarity are the straightness of the radius at the point of origin of the radial sector in the forewing, the size of the anal area of the hindwing, the presence of an oblique crossvein beyond the end of costa, the many-jointed anal cerci, the shape of the supra-anal process and the small lobe on the median basal margin of the ninth sternite. The extremely small size of these two specimens and the short, stubby supra-anal process, coupled with the present lack of understanding of limits of specific variation within the genus, suggest the safest systematic policy to follow is to name these specimens as a new species.

Acroneuria pacifica Banks

Figures 19a-19d

Acroneuria pacifica Banks. 1900. Trans. Am. Ent. Soc. 26:242.
Acroneuria pumila Banks. 1906. Can. Ent. 38:335. *New synonymy.*
Acroneuria delta Claassen. 1937. Jour. Kan. Ent. Soc. 10:42. *New synonymy.*
Hesperoperla obscura Banks. 1938. Psyche 45:137. *New synonymy.*

During the past few years, I have had the opportunity of studying in considerable detail the female types of *Acroneuria pacifica* Banks (1900) from "Washington State" (M.C.Z. No. 11311), *pumila* Banks (1906) from "Three Rivers, Cal." (M.C.Z. No. 11313), *delta* Claassen (1937) from "Yellowstone River, Wyoming" (Cornell Univ. coll.) and *obscura* Banks (1938) from "Laggan, Alberta" (M.C.Z. No. 23233). As a result of the study of these types and series of specimens from many other western localities, I am convinced that *pumila*, *delta* and *obscura* are synonymys of *pacifica*.

One of the important recognition characters of adults of *pacifica*, and omitted in descriptions to date, is the presence of three pairs of thoracic and one pair of anal gill remnants, hang-overs from the nymphal stage. The three pairs of thoracic gill

remnants are common to all North American *Acroneuria* but the presence or absence of the anal gill remnants is a very important character in the recognition of the species, and this has heretofore been completely overlooked in taxonomic papers dealing with adults of this genus. These gill remnants are of importance in other genera, also, as indicated by Frison [1929, *Fall and winter stoneflies, or Plecoptera, of Illinois. Ill. Nat. Hist. Surv. Bul.* 18(2):345-409] in connection with species of Taeniopterygidae.

My studies of the types of *pacifica, pumila, delta* and *obscura* have shown that all these types possess the anal gill remnants in addition to the usual thoracic ones. Furthermore, no essential points of difference in other characters were found among them. Admittedly, the shape of the subgenital plate of females of *Acroneuria* is a very important and useful character in the determination of species of this genus. However, studies of series of specimens from similar and different localities, and reared specimens, show that this structure, like most other structures in this group of insects, is subject to some variation.

In my opinion the differences in the shape of subgenital plate noted and illustrated by the describers of *pacifica, pumila, delta* and *obscura* are all within the limits of variation of one species, which must be recognized as *pacifica* because of priority of description. In support of this contention, I present figures 18a-18d which show the variation in the subgenital plate of four specimens of *pacifica* from Camp Sherman, Ore., July 19, 1939. Similar examples might be selected from other localities. Brachypterous adults, a condition displayed by the type of *pumila*, are frequently encountered in various genera and species of stoneflies, and I have seen many specimens of *pacifica* from Utah which were brachypterous. Nymphal and exuvial collections in considerable numbers from many western states do not indicate a diversity of *pacifica*-like species in the western states. As a result of my studies, therefore, I am convinced that *pumila, delta* and *obscura* are all synonymys of *pacifica*.

At the same time that *obscura* was described by Banks, he proposed the new genus *Hesperoperla* for it and *pacifica*, making the latter the genotype. Although the North American species of *Acroneuria* exhibit some slight differences in the mesosternal grooves, I fail to find sufficient differences in these or other characters to warrant the recognition of *Hesperoperla* as a separate genus.

TWO MEXICAN SPECIES OF XEROMEGACHILE

(Hymenoptera, Megachilidae)

BY THEODORE B. MITCHELL[1]

All previous records of the occurrence of species of the subgenus *Xeromegachile* have been in the United States and southwestern Canada. It is of interest and some importance, therefore, to discover a new species from Mexico and also to record a previously described species from that country. Both records, however, are from Sonora in northwestern Mexico, indicating a relatively slight penetration southward. Moreover, it is quite likely that ecologically the localities in which these two species were collected are more closely related to the regions north of the Mexican border than to the regions further south. All of the evidence indicates that *Xeromegachile* is of recent origin. It includes more species than any other nearctic group of *Megachile*, the great majority of them occurring in the western United States which evidently is the center of origin of the group. These Mexican records, being so exceptional, give added support to the conclusions to be drawn from the other facts concerning the distribution of the group.

Megachile (Xeromegachile) boharti Mitchell, new species

This is a close relative of *M. legalis* Cresson, the female of which has not been discovered. The male differs from *legalis* most conspicuously in the shape of the carina of segment 6 of the abdomen. This is nearly as long as it is broad in *legalis* and is markedly convex in profile, while in *boharti* it is very short and broad, obtusely triangular, and is straight in profile. Other differences are to be observed but are less evident.

Female. Size: length, 11 mm.; breadth of abdomen, 4 mm.; anterior wing, 7.5 mm.

Structure: Length and breadth of face subequal; eyes subparallel; clypeal margin straight and entire; mandible 4-dentate, the cutting edge between the third and fourth teeth quite short;

[1] Research Contribution No. 15 published with the aid of the State College Research Fund, Department of Zoology, North Carolina State College of Agriculture and Engineering of the University of North Carolina.

basal joint of flagellum very slightly longer than the pedicel or the second joint which are subequal; lateral ocelli equidistant from eyes and edge of vertex; margin of vertex nearly straight; cheeks below broader than eyes, narrowed above; mid and hind metatarsi shorter and slightly narrower than their tibiae; abdominal terga with well defined basal grooves, that on the fifth segment entire, the apical margin depressed laterally, but only very slightly so medially; sixth tergum in profile straight and with very short erect hairs visible, the surface slightly impressed on each side of an obscure median ridge.

Puncturation: Close, deep and quite coarse on clypeus, the supraclypeal area shining and sparsely punctate medially; shallow, minute and close on the shining cheeks; deep, but rather fine, separated by about their own width on vertex; slightly more coarse on mesonotum and scutellum, sparse medially, close laterally; rather shallow and close on pleura, becoming more coarse below; minute, obscure and very close on abdomen basally, becoming deeper and more distinct but still quite close, to the fifth tergum, very fine and crowded on the sixth.

Color: Black; wings lightly infuscated; tegulae, wing nervures, and antennae beneath deep ferruginous to piceous; spurs ferruginous.

Pubescence: Rather short in general; entirely white on face, cheeks, pleura, propodeum, legs and basal segment of abdomen, but pale ferruginous beneath tarsal joints; mostly black on vertex, disc of mesonotum, scutellum and discs of abdominal segments 2-6, the mesonotum anteriorly and laterally with some white pubescence and the scutello-mesothoracic suture obscurely white fasciate; segments 1-5 of abdomen with entire white apical fasciae; segment 6 with some inconspicuous silvery tomentum, this becoming brownish at tip; scopa entirely white except for a few black hairs on sixth sternum apically.

Male. Size: length, 11 mm.; breadth of abdomen, 3 mm.; anterior wing, 7 mm.

Structure: Face as broad as long; eyes subparallel; clypeal margin beneath beard straight and entire; mandible 3-dentate, the acute inferior projection subbasal; basal joint of flagellum very slightly longer than the pedicel, slightly shorter than the second joint, the apical joint slightly dilated; lateral ocelli equidistant from eyes and edge of vertex; cheeks below broader than eyes, narrowed above; front coxae with quite slender acute divergent spines, bare anteriorly and with a patch of ferruginous bristles at base of spines; front femora moderately dilated toward apex; front tarsi slender, the anterior margin of metatarsus with a barely recognizable excavation; mid and hind metatarsi short and slender; apical margins of abdominal terga depressed toward sides of second and third segments, entirely so on fourth and fifth segments, the basal grooves without carinate margins posteriorly;

carina of sixth tergum obtusely triangular, margin on each side of median angle straight, but to a slight degree crenulate, upper surface of disc with a short median ridge, the disc straight in profile; apical margin of sixth tergum with broad carinate median teeth which are nearer to the obscure lateral angles than to each other; seventh tergum produced medially into a short acute spine.

Genital armature: Stipites compressed above base, dilated and flexed apically, this apical portion beset with numerous long curved hairs; sagittae slightly exceeding the stipites in length; volsellae with triangularly pointed tips.

Puncturation: Fine and densely crowded on clypeus and cheeks; deeper and definitely separated, but fine, on the shining vertex; rather fine on thorax, densely crowded on pleura, relatively sparse in center of mesonotum and scutellum, close laterally on these discs; minute and very close on abdomen basally, becoming more deep and distinct, but still very fine, to the fifth tergum, close and irregular on the sixth above the carina.

Color: Black; wings lightly infuscated; tegulae, wing nervures and antennae beneath deep ferruginous to piceous; spurs yellowish-ferruginous; posterior face of front femur and outer face of its tibia black, otherwise these leg joints ferruginous, the front tarsi yellowish-ferruginous, the posterior margin beneath the fringe piceous, forming distinct dark spots on the second and third joints.

Pubescence: Entirely white on head, thorax and first segment of abdomen, except for some blackish pubescence on vertex and mesonotum, a few dark hairs on scutellum and yellowish-ferruginous setae beneath the tarsal joints; discs of segments 2-6 with black pubescence apically, whitish basally; the more apical segments with basal appressed white tomentum; all of the segments with entire white apical fasciae; the sternal plates with long thin white apical fringes.

Type, female, No. 5231, Calif. Acad. Sci., Ent., San Bernardo, Sonora, Mexico, March 25, 1935 (R. M. and G. E. Bohart). Allotype, male, topotypical. Paratypes, one male and two females, topotypical.

Megachile (Xeromegachile) instita Mitchell

This species has been recorded previously only from New Mexico.

Mexico: One male, N. Sonora (Morrison) [Godman and Salvin Coll., Brit. Mus., 1913-214].

SUPPLEMENTARY LIST OF MOSQUITO RECORDS FROM UTAH

(Diptera, Culicidae)

BY DON M. REES

University of Utah, Salt Lake City

In 1934 a preliminary list entitled "Mosquito Records from Utah" was published by the author in the "Pan-Pacific Entomologist." In this article, the following species were listed, accompanied by collection dates and locality records:

1. *Aëdes vexans* Meigen
2. *Aëdes dorsalis* Meigen
3. *Aëdes campestris* Dyar and Knab
4. *Aëdes niphadopsis* Dyar and Knab
5. *Aëdes communis* De Geer
6. *Aëdes cataphylla* Dyar
7. *Aëdes punctor* Kirby
8. *Aëdes stimulans* Walker
9. *Aëdes excrucians* Walker
10. *Aëdes flavescens* Miller
11. *Aëdes fitchii* Felt and Young
12. *Aëdes nigromaculis* Ludlow
13. *Theobaldia inornata* Williston
14. *Theobaldia incidens* Thomson
15. *Theobaldia impatiens* Walker
16. *Culex tarsalis* Coquillett
17. *Anopheles maculipennis* Meigen

Since 1934 the species listed above have been collected in numerous localities in the state. These additional records, with few exceptions, show only slight modifications in the distributional range of the species listed.

From collections made since 1934 it has been determined that *Aëdes vexans* is common throughout the state. *Theobaldia incidens* is also present throughout the state but is more abundant in southern Utah.

The following species constitute the supplementary list to date:

18. *Aëdes pullatus* Coquillett
19. *Aëdes intrudens* Dyar
20. *Aëdes hirsuteron* Theobald
21. *Aëdes idahoensis* Theobald

22. *Aëdes spencerii* Theobald
23. *Aëdes increpitus* Dyar
24. *Aëdes cinereus* Meigen
25. *Culex pipiens* Linn.
26. *Culex territans* Walker
27. *Culex salinarius* Coquillett
28. *Culex erythrothorax* Dyar
29. *Anopheles pseudopunctipennis* Theobald

The locality records cited for each species are accompanied by the date on which the species was first collected in that locality. Many of the species have been taken repeatedly from the same localities since the date of the first collection.

Specimens present in the author's collection probably represent three additional species but from the material available identifications are as yet uncertain.

Aëdes pullatus Coquillett

This species is prevalent throughout the state at higher elevations in the wooded mountain regions. It has never been taken in the plains or away from forests. It is frequently found associated with *Aëdes communis, Aëdes fitchii,* and at higher elevations with *Aëdes punctor.*

Utah: Beaver Creek, Daggett County, July 7, 1929 (Rees); Kamas, Summit County, June 15, 1930 (Rees); Smith and Morehouse, Summit County, May 16, 1931 (Rees); Washington Lake, Summit County, July 16, 1933 (Rees); Bald Mt., Summit County, July 16, 1933 (Rees); Provo River near Lake Tryol, Summit County, July 16, 1933 (Rees); Panguitch Lake, Garfield County, May 21, 1934 (A. C. Randle); Lake Tryol, Summit County, June 3, 1934 (A. C. Randle); Soapstone Canyon, Summit County, June 11, 1934 (A. C. Randle); Fish Lake, Sevier County, June 15, 1935 (Rees); Payson Canyon, Utah County, June 30, 1935 (Rees); Carter Creek, Daggett County, July 22, 1935 (Rees); Henry's Fork, Summit County, July 22, 1935 (Rees); Lemon's Grove, Provo River, Wasatch County, June 24, 1938 (Rees); Sterling Canyon, Sanpete County, July 13, 1939 (Rees).

Aëdes intrudens Dyar

Aëdes intrudens Dyar is found in the mountain regions of Utah. This mosquito occurs only in the forest areas and is typically a woodland species.

Utah: Near Salt Lake City, August 5, 1928 (Rees); Granddaddy Lakes, Uintah County, August 3, 1929 (W. J. Gertsch); Kamas, Summit County, June 15, 1930 (Rees); Mirror Lake, Summit County, July 16, 1933 (Rees); Washington Lake, Summit County, July 16, 1933 (Rees); Carter Creek, Daggett County, July 22, 1935 (Rees); Brighton, Salt Lake County, July 14, 1936 (Rees); Swasey Springs, Millard County, May 15, 1939 (Rees).

Aëdes hirsuteron Theobald

Aëdes hirsuteron Theobald is found in the northern and central part of the state in the low mountain valleys along the margins of the larger streams. The adults are found in the wooded regions and also in the open considerable distances from their breeding waters. It is associated with *Aëdes cinereus* and at times with *Aëdes vexans.*

Utah: Provo River, near Heber, Wasatch County, June 15, 1933 (Rees); Ironton, Utah County, April 30, 1935 (W. L. Thomas); Charleston, Wasatch County, June 27, 1935 (Rees); Wanship, Summit County, July 7, 1935 (Rees); Beaver Creek, Summit County, July 10, 1935 (Rees).

Aëdes spencerii Theobald

This species has been taken in the northern part of the state. It is usually found in the plains and prairie regions, also along the foothills of the principal mountain ranges. It is frequently found with *Aëdes dorsalis, Aëdes niphadopsis, Aëdes campestris* and *Aëdes idahoensis.* It has not been collected in the mountains at higher elevations.

Utah: Ensign Peak, Salt Lake County, May 5, 1929 (W. J. Gertsch); Lake Canyon, Duchesne County, July 5, 1934 (Rees); Como Springs, Morgan County, May 4, 1937 (Rees); Devils Slide, Summit County, July —, 1936 (S. D. Durrant); Trout Creek, Juab County, May 4, 1937 (Rees); Swasey Springs, Millard County, May 15, 1938 (Rees); Morgan, June 23, 1938 (L. Christensen); Wales, Sanpete County, May 13, 1939 (Rees).

Aëdes increpitus Dyar

This species is found throughout the state in the plains region and in the mountains at lower altitudes.

Utah: Salt Lake City, April 18, 1933 (Rees); Parley's Canyon, June 24, 1933 (Rees); Zion National Park, June 14, 1939 (Rees).

AËDES IDAHOENSIS Theobald

This species is found in the northern and central part of the state in the plains and low mountain regions. It is rather widespread over much of the same area in which *Aëdes dorsalis* is found, but is much less abundant. It is an open plains species and has not been collected in wooded areas.

Utah: North Salt Lake City, May 1, 1914 (unknown); Salt Lake City, June 1, 1929 (Rees); Bear River, Box Elder County, June, 1933 (Rees); Heber, Wasatch County, June 15, 1933 (Rees); near Woodruff, Connely Hollow, Homes Creek and Harris Hollow, Rich County, July 5, 1935 (Armstrong); Como Springs, Morgan County, July 7, 1935 (Rees); Carter Creek, Daggett County, July 22, 1935 (Rees); Plain City, Weber County, June 3, 1935 (Armstrong); Fish Lake, Sevier County, July 4, 1936 (Rees); Laketown, July 5, 1935 (Armstrong); Swan Creek, July 7, 1936 (Armstrong); Penrose, July 10, 1935 (Armstrong); Trout Creek, Juab County, May 4, 1937 (Rees); Wales, Sanpete County, May 29, 1937 (Rees); Stoddard Slough, Morgan County, July 10, 1938 (Rees); Morgan, Morgan County, June 23, 1938 (Rees); Coalville, Summit County, June 4, 1939 (Rees).

AËDES CINEREUS Meigen

Aëdes cinereus Meigen, up to the present time, has been collected only in the northern part of the state. It is a woodland species and is found breeding in the lower mountain valleys along the margins of streams. This species is associated with *Aëdes hirsuteron* and at times with *Aëdes vexans.*

Utah: River Heights, Cache County, April 28, 1934 (Thomas and Rowe); Logan, Cache County, May 21, 1935 (Knowlton); Wanship, Summit County, July 7, 1935 (Rees); Penrose, July 11, 1935 (Knowlton and Rowe); Provo River, near Charleston, June 20, 1937 (Rees); Lemon's Grove, Provo River, Wasatch County, June 24, 1938 (Rees); Holladay, Salt Lake County, July, 1940 (Rees).

CULEX PIPIENS Linn.

This species is rather rare in Utah and only a few specimens have been taken. The *pipiens* collected in the vicinity of Salt

Lake City were obtained in light traps. Several females and one male were thus secured. The *pipiens* collected at St. George were taken as larvae from which adults were obtained.

Utah: St. George, Washington County, October 5, 1938 (R. Hardy); Salt Lake City, September 9, 1939 (Rees); Holladay, Salt Lake County, September 24, 1940 (Rees).

Culex territans Walker

Culex territans is reported from the plains and prairies of northern and central Utah. This species is rare and some records here reported are doubtful.

Utah: Salt Lake City, April 29, 1931 (Rees); Bear River Refuge, Box Elder County, August 16, 1934 (C. F. Smith); Blue Creek Railroad Station, September 5, 1934 (Knowlton and Thomas); Logan Meadows, near Logan, September 13, 1934 (G. F. Knowlton); Murray, February 2, 1935 (W. L. Thomas); Ironton, Utah County, March 29, 1935 (W. L. Thomas); North Ogden, June 20, 1935 (B. E. Rees); Midvale, Salt Lake County, August 20, 1936 (Rees); Bountiful, Davis County, August 16, 1937 (Rees).

Culex salinarius Coquillett

Culex salinarius Coquillett has only been collected by the author in the vicinity of Salt Lake City, but may occur in other parts of the state. The larvae have been taken in the same pools with *Aëdes vexans*.

Utah: Logan, March 24, 1934 (Knowlton and Thomas); Corinne, March 26, 1934 (Knowlton and Thomas); Midvale, Salt Lake County, June 24, 1935 (B. E. Rees); Salt Lake City, July 21, 1937 (Rees); Liberty Park, Salt Lake City, August 11, 1937 (Rees).

Culex erythrothorax Dyar

This species is reported as being limited to California. The author has found *erythrothorax* not uncommon in Salt Lake City and vicinity and has also collected this species in several other localities in the state, as well as at Fallon, Nevada, July 2, 1940.

A number of specimens have been examined by Dr. T. H. G. Aitken, compared with material at the University of California, and identified as *Culex erythrothorax*.

Utah: Fish Spring, Juab County, November 2, 1930 (Rees); Salt Lake City, April 29, 1934(Rees); Murray, Salt Lake County, April 27, 1935 (Rees); Midvale, Salt Lake County, August 20, 1936 (Rees); Bountiful, Davis County, August 16, 1937 (Rees); Holladay, Salt Lake County, June 28, 1940 (Rees).

Anopheles pseudopunctipennis Theobald

To date, this species has only been taken in Washington County in the southern part of the state. It is very abundant in localities where it was taken in Washington County and has been collected several times in these localities.

Utah: Washington, Washington County, May 14, 1934(Rees); St. George, June 16, 1939 (Rees).

References

Dyar, H. G. 1922. The Mosquitoes of the United States. Proc. U. S. Nat. Mus., 62:1-119.

Knowlton, G. F. and J. A. Rowe. 1935. Notes on Utah Mosquitoes. Utah Agric. Exp. Sta. Leaflet No. 245.

Rees, Don M. 1934. Mosquito Records from Utah. Pan-Pac. Ent., 10:161-165.

Red Scale Out-of-doors in Berkeley, California

On February 10, 1942, a resident of Berkeley brought in a branch and fruit of the Meyer lemon thickly infested with all stages of the red scale, *Aonidiella aurantii* (Maskell). These scales were normal in size and color and constituted a healthy colony on a small lemon tree purchased from a nurseryman in Pasadena in 1937. An inspection at the time revealed no scale present and the insect was not observed until it became evident last year. Since then it has increased so as to seriously threaten the life of the tree which is growing in a garden out-of-doors. Although there have been no severe frosts in this region during the past five years there have been several frosts which have killed tender plants and which slightly injured the growing tips of citrus trees. Since this is the only time that I have observed this insect existing in the open in this region for so long a period, it seems worthwhile to register the incident. The owner is now engaged in an extermination campaign by the use of oil emulsion sprays. Since the tree is only four feet high the measures taken should prove effective.—E. O. Essig.

NOTES ON SOME FLAT BUGS FROM THE VICINITY OF MT. LASSEN, CALIFORNIA

(Hemiptera, Aradidae)

BY E. G. LINSLEY AND R. L. USINGER
University of California

The aradids recorded below were collected between May 19 and June 22, 1941, while the University of California entomology field course was stationed at Manzanita Lake, Lassen Volcanic National Park, Shasta County, California. Biological observations are by E. G. Linsley and taxonomic notes and identifications by R. L. Usinger. The collection is of particular interest because it indicates the abundance of these insects in our northern forests, 728 specimens of 19 species having been collected in a limited area in one month's time.

New plant associations are recorded for *Aradus ampliatus* Uhler, *patibulus* Van D., *linsleyi* Usinger, *fuscomaculatus* Stål, *behrensi* Bergroth, *proboscideus* Walker, *blaisdelli* Van D., *falleni* Stål, *orbiculus* Van D., *heidemanni* Bergroth, and *Mezira pacifica* Usinger. In most cases these records of plant hosts confirm previous suspicions that aradids exhibit but little plant host specificity. A few species are known to the authors from only a single host, e.g. *intectus* on *Salix*, *depictus* on *Quercus*, but the vast majority of California species, at least, seem to occur interchangeably, on *Abies concolor*, *Pinus ponderosa*, or *Pinus jeffreyi*.

Parshley (1921, p. 4) mentions spring migration flights in a general way and Usinger (1936, p. 491) specifies those species "beginning with *funestus* and *furnissi* . . . . and all of the lugubris group of which we have any first hand information." Dispersal flights may now be recorded for the first time for *Aradus ampliatus* Uhler, *compressus* Heidemann, *behrensi* Bergroth, *debilis* Uhler. Species of the following groups have now been taken in flight, thus breaking down the phylogenetic correlation which once appeared to exist: Ampliatus, Ornatus, Proboscideus, Compressus, Tuberculifer, and Lugubris.

ARADINAE

Aradus ampliatus Uhler

Taken under bark of western yellow pine [*Pinus ponderosa* Douglas] at Shingletown, May 29; Hat Creek, June 1; and Viola, June 14; and under bark of Jeffrey pine [*Pinus Jeffreyi*

Murray] at Manzanita Lake from May 24 to June 8. On the latter date a small colony consisting primarily of half- and three-fourths-grown nymphs was found. Adults were taken in flight on May 19, two days prior to the major dispersal flights of other species.

ARADUS PATIBULUS Van Duzee

Under bark of Jeffrey pine at Manzanita Lake, May 23 to June 8. Nymphs were found on the latter date.

ARADUS LINSLEYI Usinger

Previously known only from the unique female holotype from Yosemite National Park. A second female may now be recorded from beneath the bark of western yellow pine at Old Station, nearly three hundred miles north of Yosemite, on May 29. This specimen differs from the type only in its slightly shorter rostrum which attains the middle of the front coxae, shorter hemelytra which do not quite reach the base of the first genital segment, and slightly larger size, the length being 10½ mm. and the width across the connexivum 5¾ mm.

ARADUS FUSCOMACULATUS Stål

Taken under bark of white fir [*Abies concolor* (Gord.) Parry] near Viola, May 28, and Jeffrey pine at Manzanita Lake, June 12. No dispersal flight was observed.

ARADUS BEHRENSI Bergroth

The spring dispersal flight of this species at Manzanita Lake occurred on May 21 and lasted from about 5:30 to 7:00 P.M. On that evening twenty-nine specimens were taken in flight, on May 23 only three. One example was later found under bark of western yellow pine at Viola, May 28.

ARADUS APICALIS Van Duzee

No dispersal flight of this species was observed. Examples were taken under bark of Jeffrey pine at Big Spring, on June 12 (D. Stewart) and at Manzanita Lake on June 12 (T. C. Russell, J. R. Fisher).

ARADUS PROBOSCIDEUS Walker

No dispersal flight was observed. Adults were taken under bark of white fir at Manzanita Lake, May 24; of western yellow pine at Viola, May 27 (C. D. Michener), and at Old Station, May

29 (D. Kennedy); and under bark of Jeffrey pine at Hat Lake, June 14.

Aradus medioximus Parshley

No dispersal flight was observed. Collected under bark of western yellow pine at Manzanita Lake, June 8.

Aradus debilis Uhler

A small flight of this species occurred at Manzanita Lake on May 21. No examples were seen in flight at any other time. Adults were taken under bark of western yellow pine at Viola on May 19, and Jeffrey pine at Manzanita Lake on June 12. Adults and young nymphs were found on the ball fungus, *Polyporus volvatus*, near Viola on May 29.

Aradus blaisdelli Van Duzee

Found under bark of white fir at Viola, May 28 (A. J. Walz), Manzanita Lake, June 8 and 12, Hat Creek, June 11. Also under bark of western yellow pine at Shingletown, May 24. No specimens were taken in flight.

Aradus compressus Heidemann

The spring dispersal flight of this species at Manzanita Lake occurred on May 21, like that of *A. behrensi*. A few stragglers were also taken in flight on the evening of May 23.

Aradus funestus Bergroth

The spring dispersal flight of this species at Manzanita Lake coincided with that of *A. behrensi* and individuals of the two species were about equally abundant. On May 21 thirty-eight specimens were taken in flight or on tents or sheets in an area about one mile square. On May 23, three more specimens were taken in the same area and on May 25 one additional example. No further specimens were taken in flight although the area was examined each evening for the next three weeks. Subsequent examples were found under bark of Douglas fir, [*Pseudotsuga taxifolia* (Poire) Britt.] at Shingletown on May 24 (D. Stewart) and of white fir at Manzanita Lake, June 8 (Brookhauser).

Aradus lugubris Fallen

Dispersal flights of this species occurred during the late afternoon and early evening of May 19, 20, and 21. On each of

these evenings several hundred examples were observed in flight or on tents, sheets, or automobiles. During the next four weeks occasional stragglers were taken in evening flight. In spite of the fact that *lugubris* was apparently by far the commonest species in the area, its host plant was not found.

Aradus falleni Stål

This species was taken in flight at Manzanita Lake only in the late afternoon of May 23. Adults were taken under bark of Jeffrey pine at Manzanita Lake on June 8.

Aradus cinnamomeus Panzer

Found on foliage of western yellow pine at Old Station, May 29 (H. Records).

Aradus orbiculus Van Duzee

Found under bark of Jeffrey pine three miles east of Manzanita Lake, June 8.

Aradus heidemanni Bergroth

Taken under bark of sugar pine [*Pinus lambertiana* Dougl.] at Manzanita Lake, May 31.

MEZIRINAE

Mezira reducta Van Duzee

Usinger (1936:507) has commented upon the association of this species with termites. In the Mt. Lassen area nymphs and adults were found completely walled up in sixteen different colonies of *Zootermopsis nevadensis* Hagen. Nymphs were never observed outside of the nests of this termite, although several thousand hibernating adults were found massed under bark of fire-killed western yellow pine near Viola, May 28.

Mezira pacifica Usinger

This species was not found with termites. It was taken under bark of Douglas fir near Viola on May 18, and under bark of white fir at Manzanita Lake on May 19.

References

Parshley, H. M. 1921. Essay on the American Species of Aradus. Trans. Amer. Ent. Soc., 47:1-106, 7 plates.

Usinger, R. L. 1936. Studies in the American Aradidae with descriptions of new species. Ann. Ent. Soc. Amer., 29:490-514. 2 plates.

KEY TO THE MALES OF THE GENUS ATYPHLOCERAS WITH A DESCRIPTION OF THE MALE OF ATYPHLOCERAS ECHIS

(Siphonaptera)

BY NEWELL E. GOOD

Associate Entomologist, United States Public Health Service

ATYPHLOCERAS ECHIS Jordan and Rothschild

Atyphloceras echis Jordan and Rothschild. 1915. Ectoparasites, 1(1):59-60, text-fig. 64. Description of female only (1 female), from Paradise, Arizona, on *Mus* sp. Also description of genus *Atyphloceras*, p. 59, genotype *Ceratophyllus multidentatus*, C. Fox, 1909.

Male. *Head:* Eye lightly pigmented, more degenerate than in *A. multidentatus*. Labial palpus of 7 joints, reaching to or just short of apex of fore trochanter. *Thorax:* Pronotal comb composed of 20 spines. *Abdomen:* The number of apical spines (Ap. sp.) on the abdominal tergites (total of both sides) is as follows: I = 6, II = 11, III = 8, IV = 10, V = 6, VI = 5. There are 3 antepygidial bristles (Ap. br.) on each side. The lengths of these are as follows: upper = 0.11 mm., middle = 0.23 mm., lower = 0.15 mm. *Modified segments:* Manubrium of clasper (M) triangular, pointed, short, and broad at the base. Immovable process of clasper (P) short, bilobed, the apices rounded, armed with 7 bristles, 3 of which are large and are situated on apical margin of upper lobe. Movable finger (F) of clasper long with both margins convex on apical half, its rear margin provided with 3 long, thin bristles. Length of movable finger (apex to base of ventral bow), 0.29 mm. Penis (Pen.) large, thick, club-shaped. External or postero-ventral arm of sternite IX rounded ventrally, spoon-shaped or ladle-shaped, not triangular. Sternite VIII moderately sinuate, with 3 large bristles near apex.

In this species the manubrium is somewhat shorter and thicker at the base than in other *Atyphloceras*, the immovable process is similar to *A. longipalpus* Stewart, but shorter than in *A. multidentatus* and much shorter than in *A. felix*. The movable finger is similar to that of *A. longipalpus* and *A. felix*. The external arm of the ninth sternite is characteristic for the species, differing from all other known species of the genus but most similar to that of *A. longipalpus*.

Total length, 2.3 mm. Length of hind femur, 0.41 mm.

Description of male from one specimen collected in Greenlee County, Arizona, 25 miles south of Duncan (near the junction

of Greenlee and Cochise Counties, Arizona and Hidalgo County, New Mexico), elevation 4,500 feet, from *Peromyscus maniculatus*, November 16, 1938, by F. J. Gonderman of the U. S. Public Health Service Plague Survey. Allotype in the collection of the U. S. Public Health Service, Plague Suppressive Measures Laboratory, San Francisco, California.

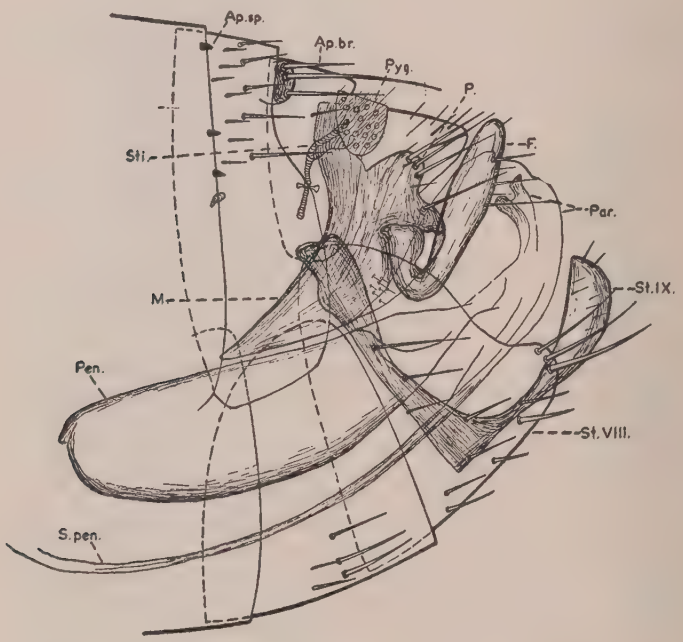


Figure 1. *Atyphloceras echis* J. and R., male, genital segments. Abbreviations: Ap. br., antepygidial bristles; Ap. sp., apical spines; F., movable finger of clasper; M., manubrium of clasper; P., immovable process of clasper; Par., paramere of penis; Pen., penis; Pyg., pygidium; S. pen., spring of penis; St., sternite; Sti., stigma.

There is also in the above collection one female from *Neotoma albigula*. Grant County, New Mexico, which agrees quite well with the original description of *A. echis* by Jordan and Rothschild and obviously belongs to this species.

A. artius Jordan, 1933, from British Columbia is not included in the following Key because the male is unknown.

Key to the males of Atyphloceras

1. External arm of ninth sternite narrow, rod-shaped, not thickened near apex; labial palpus of 5 segments; frontal tubercle distant from anterior oral angle. (from New York state) ..... *bishopi* Jordan 1933

—. External arm of ninth sternite broadened or triangular near apex; labial palpus of from 6 to 9 (usually 7) segments; frontal tubercle close to anterior oral angle. (from western North America) 2

2(1). External arm of ninth sternite triangular with a prominent postero-ventral angle; immovable process of clasper moderately long and pointed. 3

—. External arm of ninth sternite spoon- or pod-shaped, rounded ventrally, without a postero-ventral angle; immovable process short, broad 4

3(2). Immovable process and movable finger longer and narrower; internal arm of ninth sternite broader; external arm of ninth sternite with dilated apex elongate-triangular; eighth sternite slightly sinuate. (from Ventura County, and Monterey County, California) ..... *felix* Jordan 1933

—. Immovable process and movable finger shorter and thicker; internal arm of ninth sternite narrow; dilated portion of external arm of ninth sternite triangular; eighth sternite with a rather deep sinus. (San Francisco, California) ..... *multidentatus* (C. Fox) 1909

4(2). Manubrium triangular, short; external arm of ninth sternite spoon-shaped or ladle-shaped. (from southeastern Arizona and southwestern New Mexico) ..... *echis* J. & R. 1915

—. Manubrium elongate; external arm of ninth sternite pod-shaped. (from Monterey County, California) ..... *longipalpus* Stewart 1940

Female Mutillids Eating Butter

Several times during late August, 1941, females of *Dasymutilla ursula* (Cresson) were observed on the hot sandy beach at Okanagan Landing, near Vernon, B. C. Some were hurrying about on the sand, but many were feeding avidly on the film of salty butter on corn cobs left by picnickers. The velvet ants were so engrossed in their meal that they did not stir until touched, and even then only moved to another part of the cob. Females of one species, *D. ursula* (identified by Dr. C. E. Mickel) were seen feeding in this manner, but it is possible that some of the rarer species could be attracted with a similar bait.—Hugh B. Leech.

A NEW FAMILY OF HEMIPTERA-HETEROPTERA PROPOSED FOR MACROVELIA HORNII UHLER

BY A. P. McKINSTRY

University of California, Davis

The water striding families and their close relatives have been variously treated as *Ploteres* Latreille, *Amphibicorises* Dufour, *Hydrometrites* Laporte, and *Veliens* Brullé. The families Gerridae and Veliidae have always been considered as a closely related unit and the Hydrometridae, with apical claws, has been associated with them by most workers. The relationships of the Mesoveliidae and Hebridae are less clear, the former being allied to the Gerroideae by Reuter (1910) while the Hebridae, because of their "arolia," were placed in a separate superfamily.

Recent studies on the shape of the "mandibular levers" by Ekblom (1929) and on the male genitalia by Singh-Pruthi (1925) firmly establish the unity of these apparently divergent groups. More recently Lundblad (1939) reviewed the characters of the various families in an attempt to place an anomalous south African species. Lundblad found it necessary to erect a new family midway between the Hebridae and the Veliidae. This and other annectent forms provide further evidence of the unity of the group. Indeed, the family characters become so shuffled about that it becomes difficult to decide where one family begins and another ends.

Nearly 70 years ago, Uhler described the genus *Macrovelia* with one species *hornii*. That is still the only species included in the genus. This monotypic genus was placed in the family Veliidae where it has remained despite the fact that it disagrees in most fundamental characters with that family. For example, it has apical claws and is quite helpless upon the surface of the water, it has well developed ocelli and has a large, median metasternal scent gland. Actually, *Macrovelia* is an even more remarkable annectent type than Lundblad's *Hebrovelia*. Its characters are such that we are left with no alternative but to erect a new monotypic family.

The author wishes to express his appreciation to William E. Hoffmann who suggested the group for study, to H. G. Barber for the loan of specimens of *Mesoveloidea* Hungerford, to E. S. Ross for the loan of specimens from the California Academy of Sciences, and to R. L. Usinger for inspiration and many helpful suggestions.

MACROVELIIDAE McKinstry, new family

Form narrowly elongate, flat across wings, pronotum convex, head cylindrical, venter convex. *Head* narrowed between eyes, thickening posteriorly. Two ocelli present, set slightly closer to compound eyes than to median line, and slightly forward of mid point of eyes. Ocelli pointing forward and slightly outward on semi-cylindrical raised areas, disappearing posteriorly. Three pairs of trichobothria arising on dorsum near occiput, slightly anterior and laterad to ocelli, and at base of beak respectively. Third segment of beak about three times as long as fourth. First and second segments one-third or less than length of fourth segment. Basal third of third segment somewhat enlarged, narrowing again for insertion into second segment. Proportion of third segment and length of segments resembling those characters of the beak of *Mesovelia* rather closely. Antennae arising a little ventrally and anteriorly to compound eyes, near base of beak. Ventral portion of head with raised area directly under beak, striated transversely. Base of beak set deeply between two lateral, subgenal plates. Neck narrower than posterior swelling of head, set lightly into prothorax, head often extruded in pinned specimens showing small area of neck. Antennae four segmented with segments three and four showing minute diagonal striations for about half their length midway between the ends of each segment, clothed with short irregular bristles, longer on basal segment, decreasing toward distal segments.

Pronotum with distinct collar, marked with distinct pits dorsally and laterally, continuing slightly ventrally. Prosternum very shallowly concave under beak. Meso and metaterga (dissected specimens) distinctly divided by narrow membranous area. Posterior margin of mesoscutellum transverse, extending anteriorly at 45 degree angle for about one-fourth of the posterior margin on each side. Metatergum divided into three distinct areas, consisting of a larger median triangular area with base anteriorly and apex not sharply pointed at posterior margin of metatergum. Laterad of median triangular area is a more heavily sclerotized area,

also triangular, with inner margins heavily sclerotized and raised. Seven trichobothria visible in lateral triangular area. A longitudinal, semi-cylindrical area arising higher than other areas on lateral margin of metathorax. All three areas fused together. Meta and mesosterna with distinct transverse suture between them. Beak extending between the midpoint of mesosternum and posterior margin, depending on the angle of the head. Mesosternum shallowly concave under beak. Metasternum swelling toward median posterior point where scent gland opens under semicircular projection of sternum. *Abdomen* loosely connected to thorax above, fused on venter. Six distinct abdominal segments visible ventrally, the first segment reduced as in other Hemiptera. Lateral portion of connexivum fused with sternum but fairly well marked. Spiracles in regular row along ventral portion of connexivum midway between sutures. Dorsal plates of connexivum distinctly separated from medio-tergal plates by longitudinal sutures. First four sclerites of both connexivum and tergum fused. Two large distinct pits on fused portion of connexivum probably corresponding to area between segments 2 and 3, and 3 and 4 respectively. Another pair of pits present on anterior-lateral corners of tergum. Terga of first four segments ridged longitudinally on each side of median line about half way between median line and edge of tergum, forming with transverse ridges on fused segmental lines a series of semi-rectangular areas, one on each segment. Various pits suggestive of trichobothrial pits on lateral areas of first and second tergites and median rectangle of first tergite. Two pairs of very distinct trichobothria on 6th and 7th tergites near anterior margin of those segments. One scent gland opening near anterior margin of 4th tergite on median line.

Legs proportioned much the same as *Velia* and *Microvelia*, with front pair shortest, hind pair longest, but not unusually elongated. Front femora only slightly thicker than others. All tarsi three segmented, first segment much reduced but distinct, second segment of front tarsi nearly equal to distal segment, second segment of middle tarsi slightly longer, and second segment of hind tarsi nearly twice as long as distal segment. Tarsal claws two, and apical. Hind coxae about one and one-half times as long as others.

Front wings with costal area consisting of one vein considerably thickened at apex which extends about two-thirds of length of wing. This vein is split at base forming a narrow, almost indistinct cell (not included in count of closed cells). Two more longitudinal veins arise from base and with cross veins and branches, form six closed cells, the most characteristic being the boot-shaped cell lying with heel and back of leg along costal thickened margin, about midway between base and apex. On posterior margin between actual margin of wing and posterior longitudinal vein about midway between base and apex of wing is a thickened spot about

the width of a vein. *Hind wings* with three longitudinal veins, only one closed cell, another nearly closed, basal portion of first and third longitudinal veins thickened and darkened.

Type genus: *Macrovelia* Uhler, 1872.

Macrovelia occupies an isolated position not only taxonomically but also geographically. It apparently is confined to the western part of North America. Specimens before me, most of which were borrowed from the California Academy of Sciences, are from the following regions:—California: Sequoia National Park; Siskiyou County; Lagunitas, Marin County; Pine Canyon, Mt. Diablo; Cayton, Shasta County; Willow Creek, Humboldt County; Sonora; Mark West Springs; Angels Camp; Oroville; Trinity County; Murphys, Calaveras County; Fort Bragg; Cazadero; Bryson Canyon, Monterey County; Fairfax, Marin County; Redwood Canyon, Contra Costa County; Michigan Bar, Sacramento County; Leona Heights, Alameda County; Santa Clara County; Folsom, Sacramento County; Carmel; Mokelumne Hill, Calaveras County; Napa County. Brachypterous specimens are at hand from the following localities:—California: Siskiyou County; Lagunitas, Marin County; Cayton, Shasta County; Pine Canyon, Mt. Diablo; Trinity Center, Trinity County; Leona Heights, Alameda County; and a specimen from the E. P. Van Duzee collection labeled Colorado. Dr. R. H. Beamer, University of Kansas, tells me that specimens were taken in the Dakotas. Previous literature records *Macrovelia* from Colorado, New Mexico, Arizona, and California.

Collecting experience indicates that the best places to collect *Macrovelia* are foothill areas or low ranges where there is an abundance of moss, down deciduous timber and a small stream of water such as a spring which is constant in flow throughout the year. Most specimens were secured by tearing off pieces of bark and beating them into a net. However, specimens were taken at the waters edge in moss and debris and even swept from ferns growing over the water, but never over five feet from the edge of the water. None was observed to run upon the water voluntarily, nor did any specimens leave their places of hiding. They were practically helpless when placed upon the water, the hind legs soon penetrating the surface film. When they were extricated

and cleaned a few more steps could be taken and the process had to be repeated.

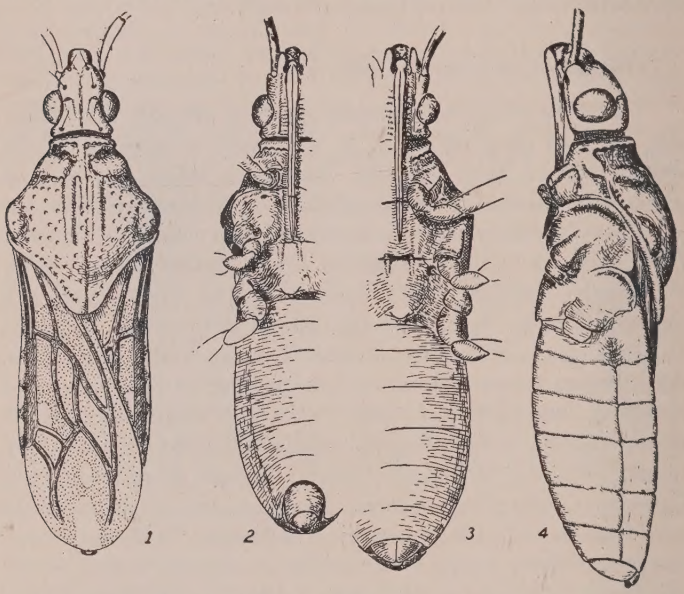


Figure 1. *Macrovelia hornii* Uhler, dorsal view. Figures 2, 3, and 4, same, ventral view of male, ventral view of female, and lateral view of female.

The differences between the Macroveliidae and the Veliidae are summarized below:

VELIIDAE	MACROVELIIDAE
1. No ocelli.	1. Two ocelli.
2. Ante-apical claws.	2. Apical claws.
3. Thoracic scent glands lateral, near hind coxae.	3. Thoracic scent gland median, ventral, well developed.
4. Dorsal abdominal scent gland lacking.	4. Dorsal abdominal scent gland present, distinct.
5. Four closed cells in front wing.	5. Six closed cells in front wing.

Superficial similarities between the two families may be summarized as follows:

1. Legs proportioned about the same as *Velia* and *Microvelia*.
2. Prothorax of winged forms quite similar.
3. Ovipositors of the same type.

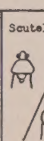
4. Colors similar.

5. Antennae appearing much the same.

Actually the family Macroveliidae is much closer to the Hebridae than to any other family, but the Hebrids have both a mesothoracic and a metathoracic scutellum showing behind the pronotum, a prominent rostral groove and bucculae, and entirely different venation of front wings.

A summary of the family characters for the surface water bugs, Amphibicorisae, is given below, followed by a discussion of each character.

TABLE OF FAMILY CHARACTERS OF AMPHIBICORISAE

Winged Forms	Scutellum 	Claws: Apical	Claws: Pre-apical	Thoracic Scent Glands: Median	Thoracic Scent Glands: Lateral	Abdominal Scent Glands	Ocelli: Present	Ocelli: Absent	Closed Cells in Fore Wing: 1 2 3 4 6	Number Tarsal Segments	Arolial Bristles: Present	Arolial Bristles: Absent	Ovipositor For Piercing Tissues
Hebridae	X	X		X		Present	X		1	222	X		-
Mesoveliidae	X	X		X		Present	X		3	333	X		Present
Macroveliidae	X	X		X		Present	X		6	333	X		-
Hebroveliidae	X	X		?		Absent		X	5	122	X?		?-
Hydrometridae	X	X		None		Absent		X	2	333	X		-
Gerridae	X		X	X		Absent		X	4	222	X		-
Veliidae	X		X		X	Absent		X	4	122 and 333	X		-

1. *The Thorax:* We will deal with fully developed or winged forms only. In all but three of the known types of Amphibicorisae, the pronotum covers all of the dorsal area of the thorax which is not covered by wings. *Macrovelia* resembles the Veliidae in this respect, but the Gerridae and Hydrometridae are also of this pattern. The Mesoveliidae and Hebridae have both the scutellum of the mesothorax and the scutellum of the metathorax showing beyond the pronotum.

2. *The Claws:* The Veliidae and Gerridae (? *Eotrechus* Kirk.) have claws originating at a point before the apex of the tarsus. Other families are normal with claws at the apex of the tarsus. *Macrovelia* has apical claws.

3. *Arolial Bristles:* In his classification of the Hemiptera, O. M. Reuter (1910) placed great emphasis upon certain structures

originating between the claws. Reuter considered that these so-called "arolia" were present in the Hebridae and absent in other Amphibicorisae. In the present study cleared slide mounts were made of all the families including the Hebridae. In all cases, two bristles were observed coming from a central pad which is in turn fastened to a tendon running up into the tarsus. The bristles in the Hebridae were as long as the claws, which accounts for their being seen first. Bristles in the other forms were shorter. No structures comparable to the lateral or basal pseudarolia (Knight, 1924) were seen in these bugs.

4. *Scent Glands:* In general these structures are difficult to see in pinned specimens. However, in the Veliidae the scent glands near the bases of the hind coxae are conveniently marked by tufts of bristles while Gerridae apparently lack these lateral scent glands but possess a single more or less distinct opening at the middle of the metasternum. This has been termed the omphalium and is characteristic of all Amphibicorisae except the Veliidae and most Hydrometridae (? *Limnobatodes* Hussey).

5. *Wing Venation:* The number of veins and shape of cells tend to break down as constant characters (in the Veliid, *Perittopus* Fieber, for example) but certain types are easily recognized. The number of closed cells is a rough way of classifying wing venation, serving merely to indicate a difference in type on the tabulation of characters included in this paper.

6. *Ovipositors:* Only the Mesoveliidae show development of the ovipositor for penetration of plant tissue. The reduced ovipositor in *Macrovelia* prevents its inclusion in the Mesoveliidae, although they are alike in tarsal claws and in ocellar structure.

References

EKBLOM, TORE. 1929. New contributions to the systematic classification of Hemiptera-Heteroptera. Ent. Tidsk., 50:169-180.

KNIGHT, H. H. 1924. Hemiptera of Connecticut. State Geological and Natural History Survey. Bulletin No. 34, p. 423, 426.

LUNDBLAD, O. 1939. Eine neue Gattung und Art von Wasserwanzen, *Hebrovelia singularis*. Ent. Tidsk., 60:29-36, Taf. I-III.

REUTER, O. M. 1910. Neue Beiträge zur Phylogenie und Systematik der Miriden, nebst einleitenden Bemerkungen über die Phylogenie der Heteropteren-Familien. Acta Societatis Scientiarum Fennicae, 37, No. 3:1-171.

SINGH-PRUTHI, HEM. 1925. Morphology of the male genitalia in Rhynchota. Trans. Ent. Soc. London, Parts I, II, pp. 127-267.

UHLER, P. R. 1872. Notices of the Hemiptera of the western territories of the United States, chiefly from the surveys of Dr. F. V. Hayden, in Hayden, Prelim. Rept. U. S. Geol. Surv. Montana, pp. 392-432.